Enlightenment was the choice:
Doctor Who and the
Democratisation of Science

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This thesis contains no material that has been accepted for the award of any other degree or diploma in any university. To the best of the author's knowledge and belief it contains no material previously published or written by another person, except where reference is made in the text. Some of the material has been accepted for publication in academic journals as single-author papers, as indicated.

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ABSTRACT

The democratisation of science — shifting science governance, work opportunities and ideologies away from the exclusive domains of elite minorities and into the hands of the people — is an important aim of science communication. If communication products such as television series can influence people's relationships with science in terms of their career choices, belief systems and feelings of ownership over science, then it is important for science communicators to understand what television series are saying about science.

In this thesis I examine representations of science in the long-running science fiction television series, *Doctor Who*. In particular I analyse the social, cultural, political and economic aspects of this representation to assess its consistency with four goals for the democratisation of science: goals that I name *franchise* (lay empowerment in science governance), *equality* (equal access to opportunities in science workplaces and careers), *progress* (democratic choice about the role of technology in our lives and our societies) and *enlightenment* (democratic freedom to choose our beliefs and worldviews about the universe).

Analysing the more than 200 *Doctor Who* serials broadcast between 1963 and 2008, I first give an overview of broad trends in the way the program has dealt with science themes and characters across four decades (1960s, 1970s, 1980s and 2000s), finding significant changes over that period.

I then analyse in greater theoretical depth three ways that debates about the democratisation of science manifest within *Doctor Who*. I show that the program varies in the degree to which it is consistent with the goals for the democratisation of science.

First, I investigate plotlines that depict struggles for science governance within societies and that show people trying to achieve democratic outcomes by renegotiating their relationship to science. Within that discussion I show that the literary construct of 'the hero' can obstruct democratic outcomes in the struggles for science governance that disenfranchised characters face. In this regard, I link 'the hero' to the social construct of 'the expert' in real world science, which has also been critiqued as obstructive to democratisation ends.

Second, I investigate real-world public dissent to ideologies of science as they are expressed allegorically in the program. Such expressions manifest through themes that counterpose one ideological position on science (such as liberal humanism) to another ideological position (such as technorationalism) in the form of a battle between archetypal characters who embody these principles. Responding to the work of scholars who have elaborated this point, I show that such expressions of dissent to science can be twisted and undermined to serve scientistic ideals through the clever manipulation of the literary imagery that is generally associated with antiscience protest.

Third and finally, I investigate the role-modelling function of scientist and non-scientist characters in *Doctor Who*: do they role-model empowered or disempowered positions for audiences within the institution of science? In concert with the literature I show that some structural elements of fiction — including the presence of a fallible scientist hero or an ensemble cast — can contribute positively to the capacity of characters to fulfil a positive role-modelling function that encourages equality in the science workplace and open access to science for all.

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CHAPTER 1 INTRODUCTION

Doctor Who is the longest running science fiction program in the history of television (BBC News, 2006b). Produced in the UK by the BBC, *Doctor Who* was first broadcast in 1963, and enjoyed more or less continuous production until 1989. In 2000 it was voted third greatest British television series ever made in a British Film Institute poll (Butler, 2007a). With its return to television screens in 2005 after a sixteen year hiatus, the program has regained enormous popularity in Britain and overseas. In 2008, the final episode for that year's series was watched by over 10 million UK viewers (BARB, 2008), or about a sixth of the population. In Australia, it was seen by more than 1.2 million (Kirk, 2008): about one in seventeen people.

Seeking to capitalise on this popularity, various commentators have proposed using *Doctor Who* as a teaching and learning tool in schools to increase students' interest in science. In 2007, the new British science minister, Malcolm Wicks, suggested that science teachers should use *Doctor Who* to teach science, saying:

> If I was a teacher I would start with a chunk from Doctor Who and Billie Piper and say, 'Actually, what was that all about and how is our textbook relevant to that'? (Wicks quoted in Gray, 2007)

Echoing principles from the academic discipline of science communication, Wicks pointed out that science lessons in school are often boring for students:

> If you start a lesson with the chemical formulae you will lose 90 per cent of the class. If you start with something interesting or important, like something they read in the paper or saw on television, they will remain interested. It can be part of an entrée to some of the more technical, important but slightly more boring parts of the subject. (Wicks quoted in Gray, 2007)

The suggestion was not met with universal applause; the British Association of Science Teachers cautioned teachers to be careful to demarcate science from fantasy if using the program in the classroom (Gray, 2007). Regardless, later that year, British children voted *Doctor Who* star David Tennant their ideal celebrity teacher, and co-star Billie

Piper came in third on the list (The Children's Society, 2007). Over a quarter of voters selected Tennant to teach science, history and geography, partly for his own qualities, such as humour and enthusiasm, but partly because as the central character of *Doctor Who* — the Doctor — "he's been around since the beginning of time" (CBBC Newsround, 2007; The Children's Society, 2007). In 2008, the British newspaper *The Guardian* published an article in its education section containing lesson-plan suggestions for using *Doctor Who* as an educational tool, including in the science classroom to "explore some of the principles behind time travel" (L. Turner, 2008). A primary school in Manchester which won a replica TARDIS (a *Doctor Who* ship) in a competition has incorporated the prop into lessons, among other things "to support science classes" (Haile, 2008). The competition was part of a museum exhibition called *Doctor Who Up Close*, which was held at the Museum of Science and Industry in Manchester, further emphasising the science education possibilities of *Doctor Who*.

Two books on the science of *Doctor Who* were published in 2006 (Parsons, 2006; White, 2006). One of them, *The Science of Doctor Who*, was longlisted for a 2007 Royal Society Prize for Science Books (Talks.cam, 2006). Its author, Paul Parsons, was invited to speak on the topic of *Doctor Who* science at Cambridge University as part of the 2008 Cambridge Science Festival (Talks.cam, 2006). Britain's iconic science popularist Sir Patrick Moore wrote in a review of Parsons' book for *The Times Higher Education Supplement* (Moore, 2006), "It is as instructive as it is entertaining. I suggest that you buy a copy." This is a strong recommendation indeed, and its appearance in the education pages again implies the potential pedagogical applications of *Doctor Who*. While much of *Doctor Who* is fantasy, Parsons picks out the aspects of the program that are not fantasy, linking scientific and technological ideas from the program — such as the Doctor's sonic screwdriver — to current real world science, such as real world sonic technology that can be used for sonic screwdriver-like applications. Thus Parsons has potentially provided a ready textbook for science teachers to consult if they want to use *Doctor Who* to teach science.

Seeing *Doctor Who* as a science-based program is not new. When first produced in 1963, one of the show's original goals was to teach science to children (Bignell, 2007; Howe, 1993). BBC Head of Drama Sydney Newman defined the Doctor decisively as a scientist, saying, "Dr. Who does not have a philosophical arty-science mind - he'd take science, applied and theoretical, as being as natural as eating" (quoted in Hulse and

Marcus, 2009). The program has changed over the years, however, and its incorporation of science themes and ideas has fluctuated. Science itself has also changed since 1963, not only in the development of scientific knowledge but in its status as a social, cultural and political institution. Where in post-war years science presented Western peoples with many reasons for optimism, in the years since, it has also presented many reasons for fear and distrust. In Ulrich Beck's terminology, Western society has shifted from a 'scarcity society' mode to a 'risk society' mode, and consequently attitudes to the risks of science have shifted too: from resignation borne of necessity to chronic fear and concern for the future (Beck, 1992).

That *Doctor Who* is still being advocated as a science teaching tool despite these changes is surprising. Certainly, its popularity together with its incorporation of science and technology in storylines mark it as potentially useful for engaging people in discussions about science who would not otherwise be interested. Designed for a family audience (BBC News, 2003a), it is perhaps unique in being able to spark conversations between people of different generations about science and technology. If engagement is the route to education as Wicks' suggestion implies, then *Doctor Who* appears to be in an ideal position to increase the science literacy of the population. More than that, it is in a position to influence and shape the population's relationships to the institution of science.

If stories simplify the complex and contradictory issues of our real lives into neat morality tales, then the way in which such tales are resolved is crucial for teaching values to audiences (Hourihan, 1997). Ruffles (2008) argues that *Doctor Who* is popular with children because of its light tone compared both with the bleakness and violence of other science fiction programs, and with the real world beset by climate change and other horrors. The fantasy of the Doctor, who always makes everything right, is a compelling one, no doubt for children and adults alike. The 'ideological closure' for each of his adventures contains a lesson which audiences may learn. Exactly how the Doctor wins, or why he doesn't when he doesn't, is an ideological statement, often about science. Therefore understanding the role that science plays in the Doctor's victories, the role the Doctor plays in science, and the show's characterisation of science more broadly can help indicate to us what publics' expectations of science and scientists in the real world might be. The representation of science in *Doctor Who* also includes the characterisation of scientists and the dynamics of relationships between scientist and

non-scientist characters. Such representation has the potential to provide role models for viewers, using figures of identification to help viewers imagine how they would like to be — and how they are allowed to be — involved in science.

To assess critically its efficacy as a science engagement tool, in this thesis I take a closer look at exactly what *Doctor Who* is saying about science as an institution. The inclusion of representations of science and technology will not necessarily in and of itself promote public engagement with science, because representation is highly political. The particular ways in which science and technology are represented will influence audiences' reception and processing of science's social meanings.

The tool *Doctor Who* provides to both the viewing public and science communication scholars is a reflection of *science ideology*. The program can make science accessible or remote; can make science seem empowering or alienating; can encourage viewers to play an active role in the governance of science or can reassure them that governance is best left to experts. Much more than promoting science literacy, *Doctor Who* — like other fictional representations of science — has the power to influence the *democratisation of science*: putting science into the hands of the people.

In this thesis, I will seek to answer the question:

> To what extent are representations of science in *Doctor Who* compatible with the democratisation of science?

The thesis is comprised of eight chapters.

In Chapter 2, 'Science communication and the democratisation of science', I locate the thesis within the discipline of science communication and draw on science communication theory and philosophy to explain in more detail what I mean by the phrase, 'the democratisation of science'. I identify four key goals for the democratisation of science that are pertinent to communicating science through fiction: *franchise*, *equality*, *progress* and *enlightenment*. *Franchise* includes the public accessibility of science and questions of science governance: who owns science and gets to make decisions about it? This goal incorporates the other three. *Equality* refers to the inclusivity of science employment and training programs: what sorts of people can

be scientists and possess scientific knowledge? *Progress* and *Enlightenment* are both terms I use ironically: progress being the goal of technological development and enlightenment being the acceptance of science's truth claims in decision-making. In order to meet the goal of franchise, I argue that people must be free to choose the roles of progress and enlightenment in their lives.

In Chapter 3, '*Doctor Who* as subject of study', I first review scholarship that examines the influence of science fiction on public perceptions of science. I then provide background information about *Doctor Who*: how it works, its major elements, and why it offers an exciting opportunity to analyse science fiction as science communication for the democratisation of science. I review previous scholarship that has examined the representation of science and political ideology in *Doctor Who* and locate gaps in the scholarship relevant to science communication. Here I also circumscribe the methodological boundaries of the thesis, and detail how I will use material from *Doctor Who* to assess its contribution to the democratisation of science.

Chapter 4, 'A chronological portrait of the presence of science in *Doctor Who*', gives a descriptive overview of changing trends in the science-orientation of the program, looking at the Doctor, his companions, and the plotlines, splitting the analysis by decade into the 1960s (1963-69), the 1970s (1970-79), the 1980s (1980-89) and the 2000s (2005-8). In this and the following chapters I frame the discussion bearing in mind the four key goals for the democratisation of science.

Chapters 5-7 are the key analysis chapters. All of them analyse representations of science in *Doctor Who* with respect to prominent issues raised within the science communication literature. The issues include the social and political role advocated for science through the literary construct of the hero (Chapter 5), the ideological function of scientist villains as embodiments of antiscience critique or its opposite (Chapter 6), and tensions between reflexivity and scientific credibility in characterising ensembles of female scientists, male scientists and lay people (Chapter 7). The analyses speak to questions about fiction's role as a tool of science communication as well as the specifics of the commentary on science that *Doctor Who* incorporates.

In Chapter 8 I summarise the contribution of *Doctor Who* to the democratisation of science. I return to the questions raised at the beginning of this chapter about the appropriate role for *Doctor Who* in the science classroom.

My research for this project effectively began in 1979, when I first saw *Doctor Who* at age 7. The story was *The Invisible Enemy*, episode 3. The Doctor and his companion Leela had been cloned and miniaturised and were touring around the Doctor's body. They came to a chasm in his head. The Doctor pointed. "That's the brain," he said, and then pointed another way. "And that's the mind." I have never forgotten the experience of watching this scene, and I believed in the brain-mind distinction for many years following. Intellectually, I realise now that the dichotomy is a highly contentious, enduring issue in philosophy, but perhaps because I learnt it as a child, it is hard for me to distance myself from a 'gut' belief in it. Semi-consciously, for years after, I sought confirmation or elaboration on the brain-mind distinction from other sources. I always imagined the distinction as being between a rational, logical, objective brain and an imaginative, creative, subjective mind (a distinction the Doctor himself makes, I now realise upon re-viewing). This reified distinction between the rational and the irrational, between the factual and the human, between science and irreverence, appears frequently in *Doctor Who*, especially within representations of the character of the Doctor himself. Ultimately this scene set up in my brain/mind the notion that cognition and emotion — fact and philosophy — are two separate things. I am not alone in thinking this, as *The Invisible Enemy*'s seemingly trivial mention of this division in fact reflects real world battles between logic (based on universal truth) and democracy (based on humanist values) or 'rational' decision making and 'emotional' decision making. It also speaks to debates between science-modernism (emphasis on objectivity) and relativism-postmodernism (emphasis on subjectivity). Here then is evidence of the power of *Doctor Who* to set up philosophical, scientific and indeed political ideology in the brain/mind of an impressionable viewer by reproducing such ideology in a way that captures the imagination.

What more does *Doctor Who* have in store for us?

CHAPTER 2 SCIENCE COMMUNICATION AND THE DEMOCRATISATION OF SCIENCE

In order to assess *Doctor Who*'s contribution to the democratisation of science, I must first specify what the democratisation of science means, and more precisely what it means in the context of the analysis of a work of fiction.

In this chapter, I examine recent trends in science communication scholarship which have shifted priorities away from science literacy towards science awareness with the goal of transferring the ownership of science from an elite group of experts to the public at large. I also discuss the relevance of post-structuralist challenges to scientism for science communication. With this disciplinary frame in mind, I then identify and elaborate the four key goals for the democratisation of science mentioned in Chapter 1 that are pertinent to science communication through fiction.

Throughout the thesis I use the word 'science' to refer to Western science, technology, engineering and medicine. This is a necessary shorthand given the number of times the word 'science' is used, but that does not mean it is an unproblematic shorthand. In using the word this way I do not wish to imply that *Western* science is the only 'real' or 'proper' science. I acknowledge and respect the many knowledge systems that exist in the world which may or may not agree with claims of Western science, and which may or may not be labelled as science by practitioners, but which assert claims on labels such as 'truth', noting that truth is also a highly problematic term. Western science is my focus in this thesis primarily because of its peculiarities of rhetorical power, which grant it a unique place in a global hierarchy of knowledges (Neville, 2006). My conclusions and arguments therefore cannot apply to other knowledge systems, regardless of their similarity to or agreement with Western science. More obviously, 'science' as it is used in *Doctor Who* always refers to Western-style science, except on the few occasions when the program overtly challenges this narrow definition.

Philosophical tendencies in science communication

Public understanding or public awareness?

The relatively young discipline of science communication, within which this thesis is located, has undergone a transformation and consolidation in the past two decades. In Britain in the 1980s, dominated by Thatcherite neoliberalism, waning public support for science funding and waning trust in the science basis of public policy led to the public understanding of science (PUS) movement, whose aims were articulated in a document widely known as the Bodmer Report (London Royal Society, 1985). The report advocated measures to increase science education and science literacy amongst the public with a view to enhancing 'rational' public debate about science-related issues and promoting public support for science (discussed in Irwin, 2006). The basic assumption of the report was that there is public disinterest in science because of poor science education and a dearth of popular science communication, and if only people were taught properly, they would discover how wonderful and important science is. The PUS movement thus presented as scientistic and paternalist, characterising the public as blankly ignorant of science and in need of fixing.

British scholar Brian Wynne strongly critiqued the PUS perspective, describing it as a 'deficit model' because it implied that the public had a deficit of active science involvement (Wynne, 1993). Wynne drew on scholarship from the sociology of scientific knowledge to make the salient point that the supposed public ignorance about science — the deficit — was actually a complex and active negotiation of social relationships with the institution of science and therefore not a deficit at all. Wynne recalled Thomas Kuhn's work which revealed the normative commitments contained within scientific discourses, commitments which belie the pretensions to ideological neutrality inherent in the Popperian model of science that is often wielded by scientists to extol scientism (here defined as the belief that science has privileged and possibly singular access to truth over all other knowledge systems). Wynne showed that "people tend to be alienated from this tacitly patronizing, controlling and denigrating imposition of normative models upon them by science" (Wynne, 1993, p. 334), and that this, more than mere ignorance, is why publics do not acquire scientific knowledge in the way that PUS-oriented science communicators would like them to. As Wynne illustrated, publics competently use techniques that could be called science every day, and they choose

when and how to incorporate scientific knowledge into their lives based on their complex, sometimes contradictory, and changing needs. Publics' relationships to scientists and to science are routinely forged in response to social conditions, including conditions in which science has material power over people's lives (Epstein, 1996; McKechnie, 1996; Wynne, 1992a, 1992b). Science is therefore often problematised by publics, who are legitimately unwilling to assimilate scientific facts and theories unproblematically, as if science was simply objectively good for them. Wynne recommended that

> In eschewing an automatic assumption of authority to a canonical model of science, and allowing greater problematization of its own founding commitments, science would trade its presumptions of control for greater public identification and uptake, hence 'understanding'. (Wynne, 1993, p. 335)

This formative paper brought the post-structuralist challenges of the sociology of science to the discipline of science communication, thus sparking a 'reflexive turn' in the public understanding of science movement. It demanded greater reflexivity on the part of science with respect to the recognition of the social construction of scientific knowledge, and with respect to the legitimation of lay people's equivocal précis of what science has to offer. According to this view, to increase public participation in all aspects of science, it is both more politically desirable and more effective to work with people's existing relationships to science and cultivate dynamics of mutual awareness and engagement than to try to cultivate scientism. This view has since consolidated into a clear tendency within the PUS movement: the public awareness of science tendency, or PAS[1].

PAS principles have not been adopted easily in practice. Since the advent of the PAS tendency, science communication has conventionally been distinguished from science education by its emphases on informal learning and science engagement as opposed to the formalised learning and science understanding that is demanded by science education. The boundary between the two is often blurred though, not only through the persistence of PUS tendencies in science communication, but also as science educators

[1] Also called PAWS (public awareness of science and engineering), PES or PEST (public engagement with science and technology) or sometimes in academic circles cPUS (critical PUS).

have attempted to incorporate PAS principles into science curricula in the classroom. As Steven Turner (2008) documents, there has been a push in recent years in several countries to broaden secondary science education curricula to include science and technology studies (STS) components, including the history of science. From a PAS perspective, this is potentially a good thing, because contextualising science in place and time highlights science as epistemology rather than monolithic universal fact, which may allow students to gain purchase in a subject that has heretofore alienated them with a fundamentalist insistence on its own correctness. However, STS's actual manifestation in school science curricula has for the most part avoided concepts of social constructionism that might suggest science knowledge is created not discovered (S. Turner, 2008). Instead, curriculum designers have used STS elements simply to foster students' interest in and support for science, once more reinforcing the normative commitments of rationalist scientism: PAS approaches, but for PUS outcomes.

It is thus possible to see PAS as simply a more effective means to PUS. The PAS approach may be better than the PUS approach at achieving higher levels of science literacy:

> The skills of accessing scientific and technological knowledge and a sense of ownership of that knowledge will impart a confidence to explore its ramifications. This will lead, *at some time*, to an understanding of key ideas/ products and how they came about, to an evaluation of the status of scientific and technological knowledge and its significance for personal, social, and economic life. (Gilbert, Stocklmayer and Garnett cited in Stocklmayer, 2001a, p. 145)[2]

For example, Steven Verhey (2005) suggests that actively engaging with students' creationist beliefs in the context of teaching evolution is more likely to increase their acceptance of evolution than ignoring their *a priori* belief systems. In much the same way, UK science minister Malcolm Wicks proposed using *Doctor Who* in the science classroom, not to critically assess the program's representations of science as an institution, but to make boring science interesting (Gray, 2007). Acknowledging the material and ideal realities that structure and colour people's lives in all their diversity is the best way to promote engagement with science's ideas.

[2] Emphasis in original. I retain original emphases for all quotes used in the thesis.

So influential has the PAS rhetoric been that some of its elements, such as two-way science engagement instead of one-way science education, have been adopted internationally as mainstream science policy principles (Wynne, 2006). But often they have been adopted to serve the same old PUS ends: notably, to 'restore' the public's trust in science, which Wynne considers to be a blatant repackaging of the deficit model, in this case a public deficit of trust instead of a deficit of knowledge (Irwin, 2006; Wynne, 2006). As Wynne notes, since the Second World War, science has produced a barrage of technologies that have had an adverse impact on relationships of trust between publics and scientists (his examples include nuclear technologies, thalidomide and BSE). This adverse impact is due neither to public ignorance about science nor to recent mistakes of science that have eroded former trust — Wynne casts this popular view as a 'creation myth' (Wynne, 2006) — but rather to science's inherent risks, which people may be willing to bear in times of hardship and scarcity but not in times of relative material ease (Beck, 1992). The problem then, as Wynne identifies it, is a lack of institutional reflexivity on the part of science: science cannot see its own inherent shortcomings and so blames everyone but itself for the lack of public trust (Wynne, 2006). Sandra Harding (1993a) describes the lack of this reflexivity on the part of scientists as 'Eurocentric scientific illiteracy' in reversal of the conventional notions of what scientific literacy means.[3]

This highlights a conflict within science communication. Traditionally, science communication practitioners have been journalists, popular science writers and museum curators whose task has been to make science comprehensible to lay people. More recently, the field has expanded to include such tasks as risk communication and the facilitation of science policy dialogue, including within those contexts (see Stocklmayer, 2005). On the academic end of the disciplinary continuum are sociologically inclined scholars such as Wynne seeking to characterise power relations between publics and science and possibly to reform them. All of these tasks could be considered manifestations of the democratisation of science in the broadest sense. But the real question is: democratisation to what end? There is a fundamental difference between seeking public engagement in order to support the institution of science, and seeking public engagement in order to allow publics to decide what to do with the institution of science, including possibly ignoring or destroying it. That difference is

[3] 'Science literacy' is a problematic term of ambiguous meaning. I refer here to the conventional PUS definition, meaning a solid grasp of basic science facts and concepts, which is problematic because of its implicit acceptance of the deficit model.

really the basis for the PUS-PAS distinction, and it illustrates the fundamentally political nature of seemingly academic positions. While for PUS, the democratisation of science is an effective way of getting the job done (i.e. getting funding for science), for PAS in its most pure form, the democratisation of science is a matter of non-negotiable political principle: in other words, it is an end in itself.

It is inevitable that these motivations come into conflict at some point: if democracy threatens science by not supporting it, or if science threatens democracy by imposing its will regardless of public opinion. At that point, science communicators must choose whether to defend science as the best path to truth and progress, or to defend human beings' right to be 'irrational' and reject science. Ends will begin to influence means, and PAS means (e.g. two way communication) coopted to serve PUS ends (e.g. building public trust in science) will ultimately be exposed as not PAS after all. For a communication discipline, which is concerned with means by definition, the end and the means must be unified.

This conflict between scientism and democracy arises time and again in discussions of the ideology of science. It is a central theme of ethical questions in *Doctor Who*, as we shall see. Michael Cobb (2005) has characterised the distinction as 'cornucopian' versus 'conservative humanist'. Even as far back as the European Enlightenment, this dichotomy can be detected in the ethical philosophies of Immanuel Kant and David Hume. Kant considered ethics to be accessible through reason, like fact: if humans exercise their faculties of reason effectively, they can see the correct path to virtuousness, and are then free to achieve their ultimate goal of happiness (Denis, 2008). This Kantian view is mirrored in the PUS rhetoric of the Bodmer Report:

> A basic thesis of this report is that better public understanding of science can be a major element in promoting national prosperity, in raising the quality of public and private decision-making and in enriching the life of the individual. (London Royal Society, 1985, p. 9)

Hume, writing against the rationalist Enlightenment trend, argued that ethics could never be discovered through reason, but were founded in the passions: in a feeling of approval or disapproval about some action. Reason, for Hume, might *guide* ethical action to achieve its aims, but it did not *motivate* action (Denis, 2008). For Kant, ethics

should be established *a priori* in order to avoid contamination by what humans actually do, rather than what they ought to do. Hume's ethics were articulated *a posteriori* to ethical behaviour. For Hume, the 'gut feeling' of right and wrong — intuitive empathy for others — was the explanation for such 'natural' virtues as beneficence. For larger societies which required additional mechanisms to function smoothly, 'artificial' virtues such as justice were constructed, building on the 'natural' virtues in a normative process with *lived social experience* (Beauchamp, 2008). In other words, ethics are subjective rather than objective. Hume's was fundamentally a humanist perspective, and one which is mirrored in the PAS rhetoric of Wynne, which recognises the experience-based responses to science:

> One of the general dimensions along which people experience science, and along which they can have understandings of it which scientists typically do not recognise, is that of its institutional structures — of accountability, pluralism or hegemony, patronage, ownership and control. This logically affects the public's readiness to assimilate the contents of science. (Wynne, 1993, p. 333)

Kant believed ethics were universal, while Hume allowed for socially conditioned relativism in their development and application (Denis, 2008). These fundamentally distinct approaches can be seen as the antecedents of the PUS-PAS dichotomy. The most basic ethical question for science communicators is which way to jump: towards the 'universal good' of scientific 'truth', or towards the hermeneutic freedom of self-determination.

An ideal PUS outcome is a society that understands science and so is capable of making 'more informed' decisions about policy and personal issues:

> Better overall understanding of science would, in our view, significantly improve the quality of public decision-making, ***not*** because the 'right' decisions would then be made, but because decisions made in the light of an adequate understanding of the issues are likely to be better than decisions made in the absence of such understanding. (London Royal Society, 1985, p. 9)

This would include “An enhanced ability to sift the plausible from the implausible” (London Royal Society, 1985, p. 10). On first appearance this seems a legitimate end. But it is founded in a scientistic worldview that only countenances a narrowly defined set of beliefs about the universe: that which Western science deems plausible. The implication here is that people ignorant of scientific facts are incapable of making fully moral decisions, a position which delegitimises people’s fears about science, their suspicions of its rhetorical power, and their complex, legitimate and effective processes of decision making regardless of scientific ‘understanding’. The ‘democratisation of science’ here manifests as the powerful indoctrinating publics with scientific knowledge before publics are taken seriously in decision making situations.

Other scholars are even less circumspect than the Bodmer Report. For example, in discussing the aims of communicating science-based risk, Lennart Sjöberg (2004) has suggested that risk communication which increases perceptions of risk in science is poor risk communication because it has failed to persuade publics to accept science. “One study found that more knowledgeable people were more ambivalent about genetic testing,” he wrote. “Consequently, risk communication remains a difficult task and has achieved only limited progress thus far” (Sjöberg, 2004, p. S48). This view surely encapsulates the extreme scientistic end of the PUS approach.

On the other hand, Granger Morgan and colleagues (2002) argue that good risk communication is that which enhances understanding, regardless of the outcome in terms of risk perception. This approach seems to straddle the PUS-PAS divide by engaging in rhetoric of support for publics’ decisions, advocating risk communication for the benefit of publics, yet still arguing that the provision of scientific information is necessary for effective decision making. This invocation of the deficit model is justified by Morgan *et al.*’s emphasis on *risk communication*, rather than science communication more broadly, and perhaps this is reasonable in situations where lives may be at stake. Nonetheless it is precisely risk communication that must confront PAS’s challenge for science to be more reflexive. Risk communication stands as the excuse for the continued paternalism of science communication, buffering between science’s ethical excesses and legitimate public critique of science. Ultimately, without institutional reflexivity, risk communication too will fail, because often people simply do not trust science, scientific experts or science communicators (see e.g. McKechnie, 1996).

An ideal PAS outcome is a sense of public ownership over science including its ethics, funding, products and goals. Australian scholars Léonie Rennie and Sue Stocklmayer have articulated their ideals for public involvement with science quite differently from the Bodmer Report:

> We envisage:
> - People who feel that science and technology lie within their interest and their personal lives.
> - People who feel that the nation's science is both their property and their responsibility.
> - People who are able to access new knowledge in science and technology, and understand how it will affect their lives.
> - People who feel comfortable about processing relevant scientific information so that their personal areas of interest are well served.
> - People who feel that their own knowledge and concerns are valued by the scientific community.
>
> (Rennie and Stocklmayer, 2003, p. 771)

These ideals encapsulate basic tenets of democracy, including governance by the people(s) (second point) and dialogue across power differences on the peoples' terms (final point), and perhaps most importantly, the *feeling* of empowerment to speak and act in the realm of science irrespective of science knowledge. Assuming such feelings are grounded in genuine material power, there is room here for people to do whatever they like with science, because it belongs to them; they are not beholden to some higher purpose. These ideals provide a good starting point for understanding what I mean by the phrase 'the democratisation of science', and they locate that understanding firmly within the PAS tendency of science communication.

Situated knowledges

It is relatively straightforward to differentiate between PUS and PAS tendencies theoretically; in practice it is harder to commit to PAS to the complete exclusion of PUS. Attempts to do so encounter a familiar problem in the social sciences: choosing between a universalising belief system that is based on a single version of the truth and

a relativist belief system that gives credence to any version of the truth. In the case of science communication, both sides can have costs. Enforcing the science version of truth regardless of the human cost is, as we have seen, both ineffective and politically problematic. Equally though, pure relativism leaves uncritical room for potentially dangerous marginal views, such as AIDS denialism, as well as potentially empowering marginal views, such as belief in the efficacy of alternative medicines which may be effective against some medical conditions. Distinguishing between the two can be impossible, and people would be justified in looking to science communicators to help them. But what is 'dangerous' and what is 'empowering' is also a matter of interpretation, for example science communicators may disagree about the dangers of discussing intelligent design theories in the context of a conversation about evolution. A science communicator who refuses to entertain the possibility of intelligent design at all risks alienating sections of their audience; equally, a science communicator who feels compelled to acknowledge that the theory of evolution by natural selection and the theory of intelligent design are both valid possibilities risks alienating other sections of their audience, and in addition sheds no critical light at all on the subject.

As others have noted, scientism is also inherently contradictory. Roslynn Haynes put it this way:

> Basic to the desire to qualify as a science is the public deference to scientific opinion, which assumes an importance in the popular mind not only out of proportion to its likely validity but in violation of the very basis of scientific method. Insofar as scientists exploit this mistaken credulity for their own ends, they are guilty of betraying that tradition of open questioning of all authorities that has allowed science to develop the position it now holds. Insofar as they themselves believe it, they have returned to the pre-Baconian tradition of the alchemist in search of absolute and unquestionable truth — the philosopher's stone, perpetual motion, and the elixir of life. (Haynes, 1994, pp. 7-8)

Scholars in the humanities and social sciences, some of whom have come from a science background, have dealt with these problems extensively. Biologist and feminist theorist of science Donna Haraway proposed the concept of 'situated knowledges' to counter both scientism's arrogant claim to a privileged access to truth and the paralysing

ineffectualness of relativism (Haraway, 1991). She notes that all vision is partial but that this does not make it nontruthful. A fly's idea of a flower sensed with compound eyes is as truthful an interpretation as that of a human sensed by refractive corneal eyes, that of a bat sensed by echolocation or that of the fly when it was a maggot sensed by photoreceptors, but all are only partial views. If the partiality is recognised and the perspective acknowledged to be true within specificities of spatial and temporal location, then we can simultaneously acknowledge multiple truths about one event.

Nancy Hartsock (1983) earlier offered a parallel argument as 'standpoint feminism',[4] drawing on Marx's notion of the 'proletarian standpoint'. She noted the significant differences between the perspectives of oppressed and marginalised groups and those of their oppressors and dominant groups as a consequence of their different relationships to power. Haraway's articulation of the idea as 'situated knowledges' refutes possible critiques of the 'standpoint' terminology as purely relativist. With Hartsock, she also refutes the claim that oppressed people cannot see clearly because of their oppression, a claim that feeds directly into the deficit model and accusations that lay people who do not trust science are irrational and 'biased'. The situated knowledges approach contends that *all* perspectives are biased, if by biased we mean partial rather than distorted. All perspectives are also rational within the constraints of both their spatiotemporal locatedness and their location with respect to matrices of social power, and none may claim to be supremely, universally, rational.

Physicist and philosopher Karen Barad has also written on this subject, using the double slit experiment of quantum physics to illustrate the point that the act of observing itself effects changes in any system (Barad, 2003). In other words, the very presence of an experimental scientist affects the outcome of experiments, suggesting that the scientific ideal of pure objective omniscience is simply not possible. What is true in one circumstance (scientist present) is not necessarily reproducable in another (scientist absent), but again that does not make it untrue. Again, this perspective emphasises the locatedness of truth: the situatedness of knowledge within particular bounds of place, time and situation.

Both Haraway and Barad dismiss amaterial rationalist claims that it is *failings in human perception* which distort clear access to a singular universal truth. They argue that

[4] Harding (2006) notes standpoint feminism's concurrent development by Hartsock, Dorothy Smith and Hilary Rose.

neither the failings nor the single universal truth exist. Barad reunifies as 'ontoepistemology' what she argues has been arbitrarily hacked apart and reified by Cartesian philosophy into ontology and epistemology. Drawing on physicist Niels Bohr, she argues that observing and being are co-constructed simultaneously within phenomena rather than the one merely interpreting the other:

> Therefore, according to Bohr, the primary epistemological unit is not independent objects with inherent boundaries and properties but rather *phenomena*. On my agential realist elaboration, phenomena do not merely mark the epistemological inseparability of "observer" and "observed"; rather, *phenomena are the ontological inseparability of agentially intra-acting "components."* That is, phenomena are ontologically primitive relations — relations without preexisting relata. The notion of *intra-action* (in contrast to the usual "interaction," which presumes the prior existence of independent entities/relata) represents a profound conceptual shift. It is through specific agential intra-actions that the boundaries and properties of the "components" of phenomena become determinate and that particular embodied concepts become meaningful. (Barad, 2003, p. 815)

In other words, the observed only comes into being simultaneously with each act of observation, and is continually being remade and remade within such 'phenomena'. There is no single truth and thus no possibility of omniscience. Understandings of the universe are inherently, inescapably, situated and partial.

Mycologist Alan Rayner (1997) similarly denies the object-ness of living 'things' such as organisms and cells by showing that their boundaries (such as skin or cell membranes) are dynamic, not fixed. He points out that the 'gaps' in boundaries are as essential as the 'walls' because if there were only walls, the 'things' would be dead, by definition, as closed systems. Rayner's work paints a picture of a dynamic, relational living universe in which 'things' are continually made and unmade out of an unbroken field of existence from one moment to the next. This picture mirrors Barad's emphasis on phenomena as the primary epistemological units. What science defines as biological objects are in fact a collection of spatio-temporally located phenomena. They are not figments of imagination, but neither are they universal, essential, eternal or bounded:

the truth of them is a situated knowledge. The necessity of refocusing in order to see both gaps and walls is a situatedness identical to Heisenberg's uncertainty principle in which either the position or the momentum of an object may be known at any given moment, but not both. A new focus, a new angle, a new moment constructs a new truth about the same system. This means that communicating science can be fraught when trying to offer an 'objective' model of a system (Stocklmayer, 2003). The room for multiple snapshots of 'truth' greatly expands, and every snapshot of truth, even (or especially) under the strictest laboratory conditions, can only ever be one snapshot of the many that are possible.

Other authors have made basically the same point about the nature of truth and the political, cultural and social locatedness of scientific knowledge. Martin Heidegger ([1954] 1977) challenged the universality of truth and posited instead the argument now called post-structuralist that knowledge is constructed rather than discovered. Michel Foucault identified the co-construction of scientific knowledge and political ideology with respect to the sciences of classification, sexuality, medicine and psychology (Foucault, [1976] 1978, [1963] 1994, [1966] 2002, [1961] 2009). His work illustrates how notions of ontology are shaped and determined by prevailing discourses. Bruno Latour and Steve Woolgar ([1979] 1986) documented the literal construction of 'scientific fact' within the lived material processes of scientific research. Harding's work highlights the ways in which politics of gender, race, class and sexuality make Western science in its current incarnation irrevocably masculinist, white and Eurocentric (e.g. Harding, 1986, 1993b, 2006). Ashis Nandy (1988) has argued that science has become one of the 'reasons of state' in the late 20th century, along with national security and development, and so is inseparable from politics in both the political structures of governance and the political discourses of power.

The consequences of this can be devastating. For example, a recent landmark legal case testing the Australian Commonwealth Government's culpability in removing 'Stolen Generations' Aboriginal children from their families, *Cubillo v Commonwealth*, was lost by the Stolen Generations complainants, in large part because of the presiding justice's invocation of the rhetoric and tools of science, including its presumed objectivity (Neville, 2006). Alisoun Neville (2006) argues that a culturally prevalent hierarchy of knowledge, with the 'hardest' sciences at the top, infests the legal system, with implications for the ways that testimony and evidence are assessed, and a

consequence of bitter disempowerment for Indigenous voices who cannot access the hierarchy's top levels. Neville found that the testimony of expert witnesses in the case varied in influence according to this 'hierarchy of knowledge', for example, evidence from the discipline of psychology was valued more highly than evidence from the discipline of history, but that the lower status disciplines held the strongest evidence in support of the complainants.

This hierarchy of knowledge is not restricted to the legal system. Science, with its constant companions reason and rationality, is one of the most powerful rhetorical tools in the world today. The vocabulary of science is commonly employed to frame political statements as objective, intelligent, evidence-based and correct, regardless of whether science's findings and suggestions have actually been incorporated into policy, and despite objections to science's claims to objectivity. Western science has given a great deal of knowledge to the West, but it is not the only knowledge system in the world, nor is it the only one to accurately predict, interpret or understand phenomena. Yet it continues to be presented in many areas as if it is. Sir Gabriel Horn, chair of the Cambridge University Cambridge for All program that aims to inform policy through science, said this as recently as 2006:

> Modern human beings have been about for some 150,000 years. Experimental science is generally considered to have begun with Galileo, roughly 400 years ago. Towards the end of the nineteenth century the pace of advance accelerated, so that modern science is a mere 100-or-so years old. During that short span of time we have begun to understand some of the fundamental physical and biological processes that operate in the universe, dispelling myth and dogma with evidence-based knowledge. (Horn, 2006)

Such statements cast all knowledge that is not Western science as 'myth and dogma'. Thus, science is not merely science, but ideology. Understanding the ideological baggage that science discourse carries around with it is critical for understanding publics' relationships to science.

Haraway's concept of situated knowledges is a useful tool for science communication primarily because it informs the demand for reflexivity. It reinforces the necessity for

reflexivity about the nature of scientific knowledge and about the legitimacy of publics' relationships to the institution of science. It also provides a strategy for negotiating diverse perspectives that neither paralyses with strict relativism nor divides with singular truths. It enables science communicators to hold onto a commitment to scientific perspectives (if they want to) while simultaneously acknowledging that science cannot ever grant anything like the full picture. It removes the PUS necessity to impose scientific knowledge, but allows room for it to emerge to a greater or lesser extent if it is invited. It actively promotes conversation and the sharing of knowledge for mutual benefit, circumventing the traps of condescension that are pitted throughout both scientistic and relativist approaches. One view need never be exchanged for another; rather, similarities can be agreed upon and differences respected in dynamic tension. Indeed, the situated knowledges approach to PAS necessarily demands the active choice *not* to reconcile contradictions, but rather to hold onto them for as long as it takes to see where they lead. Such a choice is democracy in action and can only benefit science if science's true aim is to genuinely understand the universe we live in, including ourselves. In Harding's words:

> Maximizing objectivity requires not just that we accurately represent the way we see ourselves, others, and the world around us but also that we take seriously how others see us, themselves, and the world. (Harding, 2006, p. 31)

The PAS tendency augmented with an understanding of situated knowledges provides the philosophical basis of my approach to science communication in order to effect the democratisation of science. The articulation of specific goals for science communication with respect to fiction is the topic of the next section.

Specific goals for the democratisation of science through science communication

What does 'the democratisation of science' mean in practice? In particular, what does it mean in practice for fictional representations of science? PAS scholarship points to the need for science communication to foster public ownership of science via awareness and engagement activities. But the task of articulating practical goals for the

democratisation of science remains, as does a clear statement of what we might look for in science fiction television programs and why.

To do this, I combine the above discussion on PAS understandings of the democratisation of science with discussions of science policy ideals. While the PAS literature articulates a theoretical approach, science policy literature identifies specific real world problems that need to be addressed to effect democracy. Rather than focusing on one source of science policy information, I draw on exemplars of liberal science policy instruments, primarily the *Declaration on Science and the Uses of Scientific Knowledge* endorsed at the 1999 World Conference on Science under the auspices of UNESCO and the International Council on Science (hereafter 'the *Declaration on Science*'; World Conference on Science, 1999), and radical science policy commentary, notably the writings of Sandra Harding and others in the 1993 anthology *The "Racial" Economy of Science: Towards a Democratic Future* (Harding, 1993b), identifying issues that emerge from the contradictions between these sources.

I organise the discussion of this literature into the four goals for science communication mentioned in Chapter 1. To tease out what these goals are, I begin with the overarching primary goal of *franchise*, meaning literally a democratic stake in science. This goal emerges directly from the discipline of science communication, as its founding principle. The other three goals of *equality*, *progress* and *enlightenment* are drawn from further questions that emerge from the discussion of *franchise*. I specify some practical strategies for achieving each goal with respect to the representation of science in fiction.

The Goal of Franchise

We have already seen the importance of promoting public ownership of science, given the immense power that science has to affect people's lives. The ideals of Rennie and Stocklmayer (2003) envision a situation in which nonscientist publics have the confidence to intervene around the governance of science. As Harding puts it, "An effective pursuit of democracy requires that those who bear the consequences of decisions have a proportionate share in making them" (Harding, 1993a, p. 3). Given the centrality of this to PAS, it is logical to make this the first goal in the democratisation of

science. This goal can be summed up by the concept of *franchise*: the direct political empowerment of all people with respect to the governance of the institution of science.

In bourgeois democratic terms, franchise generally means people being allowed to vote for representatives who make decisions on their behalf, and occasionally people voting directly on legislation. But this version of democracy is too limited for the democratisation of science. Part of Rennie and Stocklmayer's vision is that individual people will feel confident to seek information, to assess its relevance to them personally, and to speak their minds, and representationalism cannot fulfil that vision. In part, what is needed is more direct dialogical or consultative processes to facilitate *active* democratic participation of individuals, such as focus groups and citizens' juries to inform science policy (e.g. see Citizen Participation in Science and Technology, 2007).

Even with such processes in place, however, there are obstacles in the way of confident participation on a personal and policy level. It is the responsibility of science communicators to address these obstacles. Science carries a weighty rhetorical power that is strengthened by the use of specialised language and jargon, by the promotion of scientism including the assertion that publics need scientific knowledge to make informed decisions, and by the cultural reinforcement of distinctions between scientific experts and 'ignorant' lay people via the deficit model. In other words, the introduction of grassroots democratic structures will not be successful without a concurrent radical shift in culture, in this case in the individual-level power relations between science, scientists and lay-people.

To effect this radical transformation, work must be done on many fronts, and to detail all the ways in which science communicators can contribute to it would be a thesis in itself. In this thesis my focus is very specific: what work television science fiction might do to promote the democratisation of science. Television fiction is constrained in what it can do by the fact that it is largely one-way communication (aside from intervention by fans, which may contribute to shaping the one-way communication) and it is bound by aesthetic conventions of drama and characterisation. Here I specify a few key expectations of television fiction's representations of science to effect the goal of franchise.

Television fiction that maximally effects the goal of franchise:

(a) legitimates the knowledge and beliefs of lay people through the adoption of a situated knowledges approach to truth.
(b) legitimates the attitudes of lay people toward science.
(c) recognises the power of the socio-political environments in which relationships between lay publics and science are forged.
(d) works to transform such environments in radical ways where necessary so that people have responsibility and control over science not vice versa.
(e) makes scientific knowledge, processes, assumptions, history and philosophy patently and freely available to all in plain language, through accessible media, without the pretence that it has privileged access to truth.

I note the problematic nature of terms such as 'lay people' and 'public(s)': there are many publics, and people who work as scientists are 'lay people' in areas outside their expertise (see discussion in Burns et al., 2003). Nonetheless, the distinction continues to be made without reflexivity in everyday discourse about science, reinforcing the categories and using them to withhold power. Franchise is fundamentally about effecting people's governance over science regardless of their scientific knowledge or expertise. Television fiction has no mechanism to effect this material transference of power, but it does have mechanisms for influencing the attitudes of its viewers. Thus, role modelling power struggles over expertise and managerial rights can feed in to real world struggles for franchise.

Some elements of this set of five subgoals are noncontroversial standard fodder for science communicators of all stripes, such as the elements of (e) concerned with explaining scientific knowledge in plain language. Others are more explicitly political and remain points of conflict between advocates of PAS and PUS tendencies. It is important to elaborate on the global political context of modern Western science in order to more thoroughly emphasise the highly political demands of the democratisation of science.

Accordingly, drawing out aspects of the goal of franchise, I wish to identify three other goals for the democratisation of science. They all concern reasons why many publics feel that science does not serve their interests. They all relate to the historical fact that

Western science emerged from a culture founded on social inequalities, and so contains cultural biases and assumptions that are oppressive to marginalised people within its culture of research and education, within its products and applications, and within its ideology of truth. Democracy is not just about eliminating barriers between lay people and scientists, it is about confronting these mammoth structures of oppression which co-created Western science itself. This is a big challenge for policy makers and activists concerned with democracy, but science communicators also have an important role to play.

Goal 2, concerned with science's culture of research and education, I call *equality*. Goal 3, concerned with science's products and applications, I call *progress*. Goal 4, concerned with science's ideology of truth, I call *enlightenment*.

The Goal of Equality

In addition to the power relations between 'scientists' and 'lay people' which is the key focus of the goal of franchise, other power relations exist which stand in the way of the democratisation of science. I am talking about relations of power that infuse and co-construct every aspect of our society: inequalities of class, gender, race, sexuality and (dis)ability. These power relations act to marginalise particular groups of people from accessing social, economic and political power, including within the institution of science. This marginalisation has been noted across the science policy literature from radical scholars (e.g. Haraway, 1982; Harding, 1993b, 2006, 2008) to liberal national and international bodies (Bell, 2009; Green, 2004; Taeb et al., 2005; WISET, 1995; World Conference on Science, 1999), as well as in fictional representations of scientists as will be discussed in Chapter 3.

The *Declaration on Science* directly raises questions about issues of equality. It notes "a historical imbalance in the participation of men and women in all science-related activities" (clause 24) and "barriers which have precluded the full participation of other groups, of both sexes, including disabled people, indigenous peoples and ethnic minorities" (clause 25). It acknowledges that "[m]ost of the benefits of science are unevenly distributed, as a result of structural asymmetries among countries, regions and social groups, and between the sexes" and that the poor "are largely excluded from the

creation and the benefits of scientific knowledge" (clause 5). It demands urgent action to address these impediments both for self-evident ethical reasons and to realise the full potential of science (clause 42).

Primarily, these power relations contribute to the exclusion of marginalised people from feeling entitled or being able to access scientific knowledge, either as lay people or through jobs as scientists. More specifically, they can exclude marginalised people from certain areas of science, for example keeping numbers of women low in the physical sciences, particularly mathematics, engineering and information technology (Bell, 2009; Taeb et al., 2005). In this sense the power relations operate irrespective of the scientist-lay people axis that is central to the goal of franchise, as well as sometimes reinforcing it.

Because they pervade every aspect of society, these power relations manifest in multiple ways, including in unexamined assumptions and values that influence research priorities (discussed by Keller (1996a) with respect to masculinist bias). For example, some commentary from the disability movement has named the cochlear implant as "cultural genocide" (Seelman, 2001; Stern, 2004). This contrasts with the aims of the implant's proponents, to help deaf people hear better — the underlying assumption being that deafness is an undesirable condition that should be avoided. Robert Brookey (2001) has examined the ways in which programs of genetic research into homosexuality assume and thus construct models of sexual identity which do not reflect lived experience and which reinforce oppressive stereotypes. The underlying assumption of such research is that homosexuality requires an explanation — unlike heterosexuality, which is assumed to be self-evidently established as the biological norm (Miller, 1995). This violence of science, perpetrated as a result of the failure of practitioners of science to separate 'objective fact' from cultural baggage[5], serves to alienate already oppressed and disaffected people from participating in science on an equal footing with others. If the starting assumption of science is that there is something wrong with deaf people or that lesbian and gay people are an evolutionary anomaly then there is little incentive for deaf or gay people to get involved in science, other than to fight it.

[5] I note Harding's (2006) caution in levelling these charges to distinguish between the homophobia and ablism (and so on) of individual researchers and the more insidious discourses of oppression that permeate whole cultures, irrespective of individual researchers' conscious prejudices or lack thereof.

Aside from these overtly exclusive assumptions about the nature of reality and what science is for, marginalised people are excluded from science by cultural norms about who scientists are. A popular exercise in gauging such norms is to ask people to draw a scientist: almost invariably the resulting picture is an older white man (Haynes, 1994; Stocklmayer, 2001b), a cliché reinforced through fictional representations of scientists as we will see in Chapter 3. This obviously belies the reality of the diversity of people doing science, even though white men continue to dominate the scientific professions, particularly the upper echelons, in Australia, Europe and the US (Bell, 2009; Flicker, 2003; Steinke, 2005; WISET, 1995). It is perhaps a self-fulfilling prophecy. We often do not expect scientists to be female or transgendered, we do not expect them to be Aboriginal, we do not expect them to be camp or to have cerebral palsy. With respect to class, in Australia the image of rugged working class blokes as scientists has become increasingly plausible through famous role models like Steve Irwin, but other modes of working class identity are not so easily compatible with our image of scientists. We do not expect women from working class backgrounds to be scientists. Certainly any combination of these marginalised categories of people (Aboriginal lesbian mum from western Sydney) sounds more like a joke than like someone who might be a scientist. The same can be said of many other professions of course, with the same effect: people from marginalised groups are less likely to be perceived to be scientists, and so are perhaps less likely to grow up seeing themselves as scientists, or may simply find the prospect of trying to be taken seriously as scientists too intimidating to bother with, and so are excluded from science in disproportionate numbers.

In addition — and perhaps most importantly — these pervasive unequal power relations affect the economic, educational and psychological status of marginalised people generally, constraining life choices even when all else is equal. This monolithic fact constitutes the basis of many socio-political battles in the world today, and contributes to the exclusion of marginalised people from top science jobs, from basic science training, and from having the self confidence to pursue science careers regardless of the hurdles.

These matters are the responsibility of all human beings in every walk of life to address. But there are specific elements that must be addressed by science communication as its goal of equality in order to effect the democratisation of science.

Television fiction that maximally effects the goal of equality:

(a) ensures that discussions and representations of scientists are inclusive of socio-economic diversity, particularly with respect to prominent categories of marginalisation (gender, race, class, sexuality and disability), and without reinforcing disempowering stereotypes.
(b) legitimates and encourages critical appraisal of scientific projects and priorities with respect to their impacts on marginalised people and people's right to self-determination.

The Goal of Progress

The word 'progress' entails the expectation that things will change, for the better. It evokes the image of moving toward, going somewhere, and getting closer to a goal. In terms of science, it suggests taking steps towards solving a problem. But it also has very material connotations through its invocation in economic discourse: progress equates to wealth production (or alternatively, to wealth distribution), to material comfort and safety, to technological discoveries and applications that make our lives better.

Progress seems a logical goal of science because of the many contributions science has made to the wealthy sectors of global society, primarily in the West, particularly since the Second World War. Developments in medical research have granted the possibility of longer and more pain-free lives. Developments in agriculture have granted many people lives of relative plenty in which hunger is no longer a risk in the short term. Developments in engineering have taken spacecraft further and further into space; have made it possible for humans to see atomic structures with their own eyes (Meyer et al., 2008); have created home appliances that allow PhD theses to be typed, retyped and retyped again without using a single piece of paper, and researched almost entirely by sitting at one desk — all of which give the impression that anything is possible through science and technology. A future of comfort amidst magical technological machines sometimes seems not too far away.

As already noted though, alongside such comforts have come terrible destruction and risk. Progress, then, is fraught. This ambivalence about progress is reflected in the

Declaration on Science, which acknowledges the "environmental degradation and technological disasters" and "social imbalance" resulting from "the application of scientific advance and the development and expansion of human activity" (clause 3). Climate change research in recent years has brought home the devastasting impact that progress is having on all of our lives, including those of us who have barely benefited from its positive developments, as well as calling forth scientific and technological progress to alleviate its effects.

Harding (1993a) notes that the benefits of science have been consistently disproportionately distributed to the 'haves' and the risks to the 'have nots'. Further, she emphasises that it makes sense for publics to reject science and the ideology of progress:

> racially marginalized groups [...] may have good reasons for avoiding sciences that have had undoubted good effects for those in positions to benefit from them but, nevertheless, in other respects appear to be effectively committed to increasing consumerism and profit, maintaining social control, and legitimating the authority of elites. (Harding, 1993a, p. 3)

> If the success of these sciences required the military and political defeat of non-European peoples, we are entitled to skepticism about claims that the history of these sciences is unmitigatedly the history of *human* progress; progress for some has been at the expense of disempowerment, impoverishment, and sometimes genocide for many others. (Harding, 1993a, p. 8)

Technological progress is not economically or politically neutral: it is tied to the functioning of political structures and institutions (Nandy, 1988) and has effected the stabilisation of capitalism through the extension of techniques of control (Werskey, 2007). Heidegger argued that technology is not simply a set of politically neutral tools used to do work, but is actually an 'enframing' of the world: a particular way of looking at the world which sees its components — soils, rivers, people — only as "standing reserve" (Heidegger, [1954] 1977). The politics of progress are manifest in many examples. Those identified in Harding's edited volume (1993b) include the marketing

of the dangerous contraceptive Depo-Provera to poor, Third World and racially marginalised women through global bureaucracies of aid and population control (Bunkle, 1993); the colonisation of lands for commercial agriculture or mining to the detriment of indigenous peoples' sustenance, self-determination and sustainable land management regimes (see Orthia, 2002; Shiva, 1993; Yorta Yorta Clans Group, 2001); and the location of toxic industrial facilities in poor suburbs, regions and countries, close to desperate potential workforces who then must suffer the consequences of toxic exposure at home and at work while remaining dependent on the facilities for their livelihood (Grossman, 1993).

These are only a few of the issues; there are many others that have arisen, including more recently those that are advocated as sustainable solutions to environmental problems but which advocacy groups for the poor and disenfranchised have identified as potentially problematic. Such issues include global organic food certification schemes that threaten the livelihoods of small Third World farmers (Deccan Development Society, 2008); uranium mines and proposed nuclear waste facilities that foist the consequences of 'climate-friendly' nuclear power onto remote Indigenous peoples (Brown and Sowerwine, 2004; Friends of the Earth Australia, 2008); and biofuel production which threatens to reduce access to food and land tenure for people in poor countries, particular women and indigenous people in Africa (Eide and FAO, 2008). These examples, though mostly articulated by community advocates rather than scholarly sources, illustrate the consequences of technological development — farms, mines and industrial plants have to go somewhere if we are to 'develop' — and the deeply intertwined relationship in the West between technological progress and capitalism, which is reliant upon continued development even to solve problems caused by development itself.

Historically, the notion of progress is tied to the birth of modernity in the European Enlightenment (Bernal, 1993; Shiva, 1993). The Enlightenment saw revolutionary societal changes of the political variety, beginning with the conclusion of the English bourgeois revolution in 1688 and culminating in the American and French bourgeois revolutions a century later (Yolton et al., 1991). The political legacies remain with us in the West, at least as rhetorically endorsed ideals, if not material realities: liberalism; bourgeois democratic government; individualism; the notion of individual (or universal human) rights; a market capitalist economic system; a secular state; freedoms of speech,

thought and critique; citizenry's voting rights; free and fair elections; representationalism; social equality; rejection of the inviolability of tradition; and humanism, in the rationalist sense of a human-centred rather than transcendent worldview. Many of these ideals have been extensively critiqued because of their failure to address existing structural inequalities. Most obviously, liberalism, bourgeois democratic government and market capitalism have been critiqued by Marxists because they present as democratic while retaining a reliance upon the exploitation of the working class to effect economic 'progress'. While inspirational for the time, these Enlightenment political ideals have themselves become further tools of oppression.

The Enlightenment also consolidated the revolutionary intellectual changes begun by 17th century thinkers Bacon, Galileo, Descartes, Pascal, Boyle, Hooke, Leewenhoek, Ray and Newton, and the newly founded Royal Society of London. The 18th century saw a great expansion of scientific work at the hands of scientists such as Linnaeus, Watt, Priestley, Lavoisier and Buffon, with the number of scientific journals increasing from several dozen to several hundreds over the century's course (Scitext Cambridge, 2000). Many of the important scientific legacies of this period are with us still: for example Newtonian mechanics, Linnaean taxonomic nomenclature, Lavoisier's chemical elements, Buffon's refutation of the Bible-based estimates of the age of the Earth, and the scientific method first described by Ibn al-Haytham in the early 11th century (Steffens, 2006) and championed by Bacon.

The twin births of liberal democracy and Western science in the Enlightenment are no coincidence. Both emerged in response to feudal authoritarianism, against the oligarchical chains of church, monarchy and aristocracy. Theoretically they offered a democratic equality of access to truth for all, rather than privileging the powerful (Harding, 2006). The unity of the fight for science and democracy under principles of *rationality*, *truth* and *freedom* is easy to rhetoricise. It is easy to find in contemporary liberal documents including the *Declaration on Science*, for example clause 31: "[Science] relies on critical and free thinking, which is essential in a democratic world" (World Conference on Science, 1999). But more pragmatic links between capitalist expansion and technological development are also apparent, even in a document designed to address poverty and inequality:

> scientific research and its applications may yield significant returns towards economic growth and sustainable human development, including poverty alleviation, and [...] the future of humankind will become more dependent on the equitable production, distribution and use of knowledge than ever before (World Conference on Science, 1999) (clause 11)

Economic growth, development and the alleviation of poverty are here presented together as a package for a global society dependent on science and technology: an Enlightenment aim if there ever was one. It is indeed easy to find such links in the science fiction of the Enlightenment: the British utopian fictions of the 18th and 19th centuries. Consider this passage from Thomas Northmore's utopian story *Memoirs of Planetes*:

> commerce is of greater advantage to mankind than the opposers of commerce are aware of. The sciences of navigation and astronomy are advanced by commerce. The happiness of man in a moral view is likewise increased thereby, inasmuch as the laws, manners, customs, and improvements of nations, are thus made known to each other: the less civilized therefore may reap advantage from the more advanced in civilization. (Northmore, [1795] 1994, p. 190)

The roots of the ideology of progress are thus laid bare. Aside from its flowery language, this could well be a manifesto for economic and technological development from the 20th or 21st centuries.
Given this context for the concept of progress, its inequities, risks and problems, what, then, would the democratisation of science look like with respect to technological development?

Despite its critiques of science's disasters, the *Declaration on Science*'s solution is to continue to support science. It seeks "the strengthening of public trust and support for science" through vigorous democratic debate (clause 4), and declares that science's role "promises to be even greater in the future" (clause 8). Alan Irwin's (2006) work on science policy initiatives in 21st century Europe documents that this perspective is very common, including in the influential UK House of Lords *Science and Society* report

which advocated the routine consultation of public views in science policy (House of Lords Select Committee on Science and Technology, 2000). Irwin notes that the call for increased public dialogue "is intended to secure what the Lords see as science's 'licence to practise', but not to *restrict* it", and that the "commitment to progress through science is maintained: the challenge is to find more inclusive methods to achieve such progress" (Irwin, 2006, p. 306).

There is very little reflexivity here. The *Declaration on Science* presents a technologised future as inevitable. The future, therefore, looks more like the West than like the rest of the world. Such an assumption continues the work of Western imperialism and colonialism begun centuries earlier. The *Declaration*'s unreflexive support for science cannot be sustained if democracy is the goal. Accordingly, Harding strongly critiques as naïve the proposals put forward by some science reformers that:

> it is possible to isolate and practice pure sciences and that there is no need to make changes in the Eurocentric and racist societies in which the pursuit of 'value-neutral science' has been an integral part (Harding, 1993a, p. 11)

To effect substantive change in the operation of technological development, radical societal change is thus required.

The global economics of progress and the normative 'good' of global development locate the battlefront of debates around progress in the 'Third World', where the brunt of technological risks and hazards are experienced, and where the benefits are scarce, or have been until relatively recently. Richard Levins and Richard Lewontin (1993) describe four approaches to science in the Third World. 'Sycophantic pragmatists' see a rich and vibrant science research and development industry as a desirable end but recognise poor countries cannot afford it, so focus on developing small-scale industries of most direct practical application. 'Conservative developmentalists' desire the development of poor nations economically and technologically. 'Radical developmentalists' reject the negative consequences of technological development under unbridled capitalism, but embrace development in 'good' science and technology as a solution to poverty, starvation, disease and so on. And finally, dual tendencies

Levins and Lewontin call ‘humanism’ and ‘mystical antiscience’ reject science entirely as purely imperialist, oppressive, dehumanising and destructive.

Levins and Lewontin critique the first three of these approaches as insufficiently reflexive about the political nature and political history of science. They implicitly critique the fourth as being blind to the possibility that science could be non-oppressive in other material circumstances. They posit instead a fifth possibility, whose development they locate among “movements for feminism, the new Left, ecology, alternative health care, and radical science in industrial capitalist countries and around the edges of national liberation movements in the Third World” (Levins and Lewontin, 1993, p. 320). This approach recognises that Western science was created within Euro-North American bourgeois democracies, and is developed mostly by middle-class, white men “in ways that meet their own material and ideological needs” (Levins and Lewontin, 1993, p. 320). But it sees global science as developing unevenly, reflecting local and global interests and power structures rather than manifesting homogeneously and monolithically across the globe. The approach thus resembles Haraway’s situated knowledges approach to understanding truth. Importantly, the authors caution against assuming a ‘stagist’ progression of technological development: that “the science developing now in the Third World must recapitulate the history of Euro-North American science” (Levins and Lewontin, 1993, p. 321). Recognising the spatiotemporal locatedness — the historicity — of technological development is necessary to understand its material and ideological agendas and powers. It is also then necessary to work towards structural societal change that will enable technological development to proceed in the hands of all people, for the benefit of all people.

Thus, the democratisation of science requires that our current notions of ‘progress’, founded in the European Enlightenment with the twin births of rational scientism and liberal bourgeois democracy, be opened to radical questioning. This necessitates opening the *possibility* that ‘progress’, ‘development’, ‘technology’ and the institution of Western science itself be rejected wholesale. ‘The goal of progress’ is then somewhat ironically phrased here. ‘Change for the better’ — progressive change — could mean a permanent halt to technological and scientific progress as it is conventionally defined, if that is what people decide. Alternatively, it may mean the pursuit of technological development in new ways, for new ends. In the meantime, it certainly entails an

equalisation of the distribution of risks and benefits between haves and have nots, the dominant and the marginalised.

Therefore, television that maximally effects the democratisation of science with respect to the goal of progress:

(a) promotes public awareness of the global politics of technology and scientific development: its embeddedness in oppressive power structures such as racism, sexism and class inequality; its economic ties to institutions of governance and to corporate interests; its control by the powerful 'haves' to the disenfranchisement and endangerment of the 'have-nots'; its historical origins in patriarchal, Eurocentric, class society with interests in exploitation and wealth.
(b) problematises the inevitability of technological development however it is defined and actively works against belief in such an inevitability, even if supporting particular technological developments in the short term.
(c) raises awareness of the unequal distribution of technology's risks and benefits.
(d) elicits public discussion about technological development within these contexts.

The Goal of Enlightenment

Like the 'Goal of Progress', the 'Goal of Enlightenment' is a phrase steeped in irony.

Plato and Aristotle, via Bacon and Kant, may be credited with popularising the idea that there is one universal truth and all we must do is use our faculties of reason to reveal it. This is the origin of scientism. Where 'progress' refers to economic and technological development, 'enlightenment' refers to the revelation of truth. It is about the nature of knowledge, objectivity, rationality.

Like progress, the notion of 'enlightenment' emerged (unsurprisingly) from the European Enlightenment, and the two concepts are thus closely related. Heidegger ([1954] 1977) connects the two with his argument that technology is an enframing

based on a particular worldview: the worldview that there is one universal truth and rational science is the path to seeing it. Guillermo Gutierrez connects the two in the context of European imperialism in a passage from *Ciencia-Cultura y Dependencia*:

> If in the first instance one could speak of the expansion and conquest as a result of the technological superiority of some peoples over others, in a second stage the technological superiority and the greater military capacity was made synonymous with rationality; and in the final stage the rationality was no longer presented as a cause of the domination to be converted directly into its justification. The historic fact of European expansion is transformed into a natural phenomenon, a necessary consequence of the expansion of Reason over the world. A rationality was transformed into *Rationality*, a way of knowing was transformed into Science, a procedure for knowing became the Scientific Method. The vast enterprise of dominating the world in a few centuries was sufficient argument to demonstrate the imposition of European reason as a universal and necessary development. (Gutierrez quoted in Levins and Lewontin, 1993, p. 316)

Gutierrez highlights the origin of the rhetorical power of science (see also Dunn, 1979). He illustrates how deeply rooted that rhetorical power is, and how deeply invested in it are the powerful. The ideology of truth is no mere plaything of the intelligensia, but a powerful force for domination and oppression. In the words of John Tulloch and Henry Jenkins, "Scientism — where the technical 'management of things' justifies the domination of people — is a closed discourse entirely in the hands of a technocratic elite" (Tulloch and Jenkins, 1995, p. 35).

But this particular perspective is not how science was seen by the revolutionary thinkers of the Enlightenment, nor by their conservative descendants, the scientistic thinkers of today. Scientism posits that before the advent of Western science, truth was shrouded in a darkness of superstition and mysticism perpetuated by the powerful — church, monarchy and aristocracy — and that therefore science was the path to liberation. This point of view is wonderfully expressed by the 18th century dissenter William Hodgson in his utopian fiction, *The Commonweath of Reason* (Hodgson, [1795] 1994). Like 21st

century science communicators, Hodgson abhorred scientific jargon, and for the same reason:

> unintelligible and technical terms have been introduced into all the sciences, and thus by a combination of circumstances that have had all the shew of accident and casualty, although in fact they are connected links of the great and heavy chain that has been villainously forged to bind man down in the most degrading ignorance, knowledge and instruction has been ingrossed by the few to the injury of the many, and has been made a lucrative trade in the hands of those, who, seduced by corrupt influence, have, instead of imparting it generally, most scandalously abused it, from a conviction that they were in no fear of detection by the generality of their fellow citizens, and concurred in the great but diabolical plan of maintaining IGNORANCE, CREDULITY and SUPERSTITION, by means of which men have been made SLAVES. (Hodgson, [1795] 1994, pp. 239-240)

Hodgson's central thesis was that corruption is "the most dreadful evil" and a "commonwealth of reason" is needed to eradicate it. He argued passionately for the equality of all people, proposing the abolition of titles, wealth, exclusive privileges, national religious establishments, and lawyer's fees (Hodgson, [1795] 1994). He proposed instead a "rational Government, to be founded on the indefeasible rights of man" (Hodgson, [1795] 1994, p. 213). Hodgson's righteous anger is palpable, and his passion contagious, fuelled no doubt by his imprisonment for sedition in 1793 when he wrote the work (Claeys, 1994). He radically championed the cause of liberal democracy with its most evocative notions capitalised: humanity, truth, liberty, fraternity and equality all sit in prominent highlight. He sought a law-bound secular society in which the few necessary laws are decided by the will of the majority. He defended freedom of thought and speech and a minimum wage. He advocated prison reform, to reconduct imprisoned citizens "into the paths of TRUTH, VIRTUE, and REASON" (237), and he stood for the abolition of capital punishment. He spoke highly of education: "what I conceive to be the most interesting and important of human objects, since from it springs the only permanent liberty and durable happiness of man" (238). He contended that authoritarian rulers of all varieties throughout history have deliberately kept people ignorant, knowing that "KNOWLEDGE and LIBERTY went hand in hand, and that wherever the first

prevailed generally, the latter must be the inevitable consequence" (238). Hodgson condemned the cynical hypocrisy of rulers who at once opened universities, but kept labourers' wages so low that they could never afford such an education.[6] Hodgson wanted secular, publically funded schools which were to be fitted out with scientific equipment for mathematics, astronomy, optics and more. Inspirationally radical for its time, Hodgson's vision epitomises the Enlightenment conviction that scientific reason applied to politics creates a transparent, free and equal society. Franchise, equality and enlightenment were surely his priorities.

Enlightenment notions of truth, however, have been soundly challenged by post-structuralist scholarship in a number of fields (as we have seen) as well as by non-Western peoples and Western scholars of non-Western cultures (e.g. see the papers by Needham, Bernal and Weatherford in Harding, 1993b). Many of these interventions have rejected such Eurocentrism as the furtherance of colonialist projects, as discussed above. Recently, there have been trends to initiate dialogue between scientists trained in the Western tradition and indigenous peoples not trained in Western science, as a form of information sharing and mutual empowerment or for the benefit of disenfranchised indigenous communities (e.g. Orthia, 2002; Woo et al., 2007). A prominent outcome of such dialogue has been the legitimation of indigenous, traditional and customary knowledge systems as highly predictive of and closely contouring shared experience — rather than as the superstitions and ignorance of 'primitive' peoples as the dominant Enlightenment opinions contend.

There is still a problem here, however, because such knowledge systems are legitimated primarily *because they agree with Western science*. Western science has remained the yardstick for assessing the worth of other knowledge systems. In the *Declaration on Science* (clause 26), "traditional and local knowledge systems" are acknowledged as having made "a valuable contribution to science and technology" — but are not described as science in their own right (World Conference on Science, 1999). Nor are they given the same credibility as science in terms of the *Declaration*'s demands for science education. Clause 10 states that "access to scientific knowledge [...] from a very early age is part of the right to education belonging to all men and women", and "science education is essential for human development". Clause 34 says "Science education [...] is a fundamental prerequisite for democracy and for ensuring sustainable

[6] Glen Aikenhead (2001) discusses the cultural elements of science education that continue this exclusivity.

development." Such statements universalise human rights discourse, the need for democracy, and the need for science education, but from an utterly Western perspective. Little acknowledgement is made of non-Western political systems or knowledge systems, many of which have fostered egalitarianism and sustainability for hundreds or thousands of years. Simpson (2004) notes that many facets of indigenous 'traditional' knowledge agree with Western science, and so Western science has accepted them, but aspects of indigenous knowledge systems that exist in opposition to normative Western science — more spiritual elements for example — are rejected by scientists.

Once again, what is required is a situated knowledges approach to truth. The real goal of enlightenment lies in recognising Western science as just one (or several) of many ways of seeing.

Television fiction that maximises the democratisation of science with respect to the goal of enlightenment:

(a) qualifies discussions of 'science', 'truth' and 'fact' with an awareness that Western science presents one of many possible versions of the truth.
(b) promotes awareness of the history of the philosophies of science, objectivity, truth and rationality, to ground understandings of these ideas in time and space.
(c) elicits public discussions of the partial nature of perspectives on truth within these contexts, grounded in the contexts of people's own lives.

It is easy to see how each of the four goals — *franchise, equality, progress, enlightenment* — is related to the others. They are all united by their problematisation of power dynamics with respect to science. Like most institutions in the world today, such power dynamics reflect deeply rooted trends of class inequality, sexism, racism, heterosexism, and the marginalisation of people with disabilities, in addition to the hierarchies of scientific expertise that are the traditional targets for science communicators. Thus, the distinctions between these four goals are somewhat blurry and there is considerable overlap.

If science-based fiction influences audience views about science, then science's portrayal in *Doctor Who* has ramifications for the democratisation of science, including

with respect to the four goals: to invite or exclude audiences from claiming ownership of science knowledge, institutions and debates (*franchise*); to help them see themselves engaging in scientific or technical work or to make them feel unwelcome (*equality*); to influence their approval or disapproval of technological development(s) (*progress*); to shape their ideas about the relationship of science to truth (*enlightenment*). The next chapter reviews the impact of science fiction on audience perceptions of and attitudes to science, and introduces the world of *Doctor Who* to identify how movement towards these goals will be assessed.

CHAPTER 3 *DOCTOR WHO* AS SUBJECT OF STUDY

As will become apparent, *Doctor Who*'s explicit engagement with ideologies of science and politics makes it an ideal candidate for investigating fiction's contribution to the democratisation of science.

In this chapter I introduce *Doctor Who* as the case study of the thesis. I give an overview of the program's terminology and format and its dramatic constraints. I then review the literature on *Doctor Who* to understand what commentators have written about it not only as science-based drama, but as an overtly political program. Finally I bring this material together with the four goals for the democratisation of science to outline the method I will follow in analysing *Doctor Who* in the remainder of the thesis.

Before proceeding to that, I review scholarship on the role of science fiction in science communication, with specific regard to science fiction's contributions to the democratisation of science. It is clear that real people have particular relationships to science, forged in social contexts constrained and constructed by hierarchies of power. But how can fiction have an impact on this? How does fiction function as a tool of science communication? That is the topic of the first section.

In this chapter I do not engage with the many ongoing arguments about the boundaries of the science fiction genre, especially since *Doctor Who* is held to breach them at times (Leach, 2009). Instead I use the term 'science fiction' loosely to refer to fiction that contains science elements, and limit my literature review to scholarship from the science communication field.

The impact of science fiction on public perceptions of science

As a young discipline, relatively little science communication scholarship has examined science fiction, but what has been done suggests that science fiction plays a significant role in the public awareness of science. Science fiction is not merely entertainment. Peter Weingart and Petra Pansegrau (2003, p. 227) contend that science fiction "occupies the role of the 'conscience of society and science' among the general public". It offers the opportunity "to speculate about the nature and extent of links between

expertise, in its various guises, and democracy, between 'science' and 'the people'" (Lambourne et al., 1990, p. 82). Søren Brier (2006, p. 155) defines the genre of science fiction thus:

> [It] is almost always about new technological frames for a society and the social consequences of this, or shows that no matter what new technology one invents, the social problems will be the same.

It can thus be a representation of the ambivalence of publics' relationships to science and technology.

Some commentators suggest that fiction not only reflects public attitudes but also shapes them. Paul Slovic (2000) argues that vivid films can distort public perceptions of the risk of science-related issues. The mere mention of possible adverse consequences of a given activity can affect risk perceptions, but the worse the scenario, the greater the negative effect. Eric Jensen's (2008) study of the UK public debate around human cloning attributes enormous rhetorical power to science fiction, beginning with Aldous Huxley's *Brave New World*. Huxley's novel set the initial frame for the 21st century cloning debate as a doomsday scenario. Jensen notes that this frame was so powerful in the public imagination that cloning advocates could not combat it, but were forced rather to work around it. They achieved support for *therapeutic* cloning only by deflecting public fears towards the more contentious *reproductive* cloning that was represented in the novel. Jon Turney (1998) argues that the myths and cautions in Mary Shelley's *Frankenstein* have shaped the direction of scientific research in areas such as genetics, and have strongly influenced the public discourse about such sciences.

The flip side of this is the discursive link between state-controlled technological expertise and moral authority in film and television such as seen in police and spy dramas, a connection flagged by Robert Dunn as early as the 1970s. Such programs idealise technological solutions to social problems (Dunn, 1979). Recent television programs such as *CSI* and *Silent Witness* increased public interest in forensic science, and this was reportedly accompanied by an increase in the number of UK university forensic science courses from two to over 400 between 1991 and 2003 to cope with student numbers (BBC News, 2003b). Here then is a compelling link suggesting fiction's potential to alter relationships between publics and science.

Several authors have investigated the role of science fiction in promoting public understanding of science concepts and facts. Christopher Rose (2003) suggests that science-based plots in fiction are useful tools for facilitating discussions promoting public engagement with science. Indeed, Rose uses science fiction films as starting points for teaching undergraduates the basics of new technologies in biology. He suggests that factual inaccuracies in science fiction need not detract from their overall efficacy in promoting engagement with science if discussions are guided to connections and parallels with real science rather than dwelling on the problems of plausible representation. Others have not been so circumspect. David Kirby cites a long list of scientists, including the US National Science Foundation, who believe that science fiction has a detrimental impact on science literacy and has "corroded the public's critical thinking skills" (Kirby, 2003, p. 262). While himself not willing to declare that science fiction *shapes* public opinion, Kirby suggests that it does *reinforce and cultivate* existing opinions and beliefs about science.

Science fiction can even feed back into science fact, influencing the directions of research. In recent years for example, the European Space Agency has scoured science fiction literature in its search for ideas for possible new technologies (Clarke, 2006). The longest-running US science fiction television series, *Star Trek*, has been so influential as a cultural ambassador for science that NASA incorporated *Star Trek* references into its space program, as Constance Penley (1997) details. The name of the first space shuttle was changed from *Constitution* to *Enterprise* after popular demand. The *Star Trek* theme was played when it was rolled out. NASA mission computers were named Uhura, Scotty and Spock. Actor Nichelle Nichols, who played Lt. Uhura in the original *Star Trek* series, was employed to recruit women and people of colour to the space program. The first African American woman in space, Mae Jemison, was inspired to pursue her dream after watching Uhura, and she began each shift of her shuttle mission with Uhura's catchphrase, 'hailing frequencies open' (Penley, 1997). *Star Trek* influenced countless scientists to become scientists, being a primary source of information about science and technology for young people (Kitzinger et al., 2008; Tulloch and Jenkins, 1995). Anecdotal evidence suggests that *Doctor Who* has served a similar function.[7] Stephen Hawking and Paul Davies, perhaps two of the most well

[7] I am indebted to Dr Elizabeth Beckmann for generously sharing with me her own story of growing up with *Doctor Who* in Britain in the 1960s and the influence it had on her interest in science. For Beckmann, *Doctor Who* looked to the future, explored new ideas and gave reasons for optimism, whereas so much else around her and on television looked to the past and dwelled on the Second World War. Science seemed to present opportunities to her and her

known living scientists in the world, were also inspired to become scientists by science fiction, though Davies has pointed out that he is yet to meet a real life scientist who resembles *Doctor Who*'s Doctor (Davies, 1990; White, 2006). Weingart and colleagues similarly note that scientists usually feel misrepresented in fiction (2003).

Star Trek is perhaps better known for its political ideology than for its ideology of science, but once more, a brief look at this demonstrates the power of science fiction to influence public opinion. Originating in 1966 — three years after *Doctor Who* — *Star Trek* is famous for unabashedly promoting an American-style liberal democratic vision for the universe via the Federation Starfleet officers who are its main characters, and the plenty, harmony and *Pax Federata* that the officers share thanks to advanced technology that produces food from nothing and cures wounds and illness without surgery. Mark Bould (1999) cites *Star Trek*'s superficial confirmation of liberal democratic sentiments as one of four reasons for its success. Federation ideals and the problematic (implicitly colonialist although explicitly anticolonialist) way in which they manifest in the program have been extensively critiqued (see Bernardi, 1998; Bould, 1999; Tulloch and Jenkins, 1995). Regardless, *Star Trek* fans often take the political beliefs of the program very seriously, touting them as the best model for society. For example, fan Barbara Adams turned up for jury duty at the 1990s 'Whitewater' trial wearing a Starfleet uniform, to promote the program's "good solid values" in the service of justice (Penley, 1997). A 1992 US election year bumper sticker read, "Picard and Riker in '92" (Penley, 1997), referencing the ship's captain and second in *Star Trek: The Next Generation*.

Science fiction has in fact influenced perceptions of science for nearly 400 years. Francis Bacon's *The New Atlantis*, published posthumously in 1627, was a utopian fiction of enormous social influence. It provided an organisational model for the Royal Society and presaged the workings of modern scientific research institutes and the international scientific community (D. Simpson, 2006). The work offers an idealised picture of the harmonious, virtuous life of a community built around the gathering, analysis, synthesis and application of knowledge, and resultant mastery of nature (Bacon, [1627] 2000). It proposes a neat classification of modern research disciplines too, through Bacon's descriptions of the 'arts' of the community: medicine,

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generation, and *Doctor Who* helped to make it seem possible (Elizabeth Beckmann, pers. comm.). In addition, the anonymous authors of the UK website 'Sci-Fi Science' claim to have become scientists because of *Doctor Who* (see http://scifiscience.co.uk/doctorwho/drwho.html).

meteorology, agriculture, biology, food science, pharmacology, thermodynamics, optics, acoustics, geology, chemistry, engineering, and mathematics all make discrete appearances, though mostly not so named. Through this utopian fiction, Bacon illustrated his vision of the compatibility of science and the reason-based political ideals that formed the basis of his philosophy. The inhabitants of Bacon's utopia are virtuous: they do not take bribes or gratuities, they are generous hosts, they do not allow polygamy or fornication, and they are devout Christians. While his utopia could not be enjoyed by all (for example the work contains racist remarks about Jewish people and 'Æthiops'), there is no doubt that this is intended to be something of a paradise, just as the *Star Trek* universe is despite its many shortcomings. Science fiction thus provides science-oriented role models and decision-making tools to publics via its characters, its settings and its representations of ethical, political and intellectual dilemmas.

More broadly speaking, science fiction can influence public ideas of what science is. A tension is often found in fictional representations of science between a demystified science that is technical, rational and earthly (for example in the *Quatermass* series, a stated influence on *Doctor Who*), and a fantastical science that is somewhat magical and mysterious (for example in *Frankenstein*). Simon Locke (2005) has argued that while these dichotomous representations may be present, they are not monolithic in their impact on publics, but rather constitute an aspect of ambivalence in terms of public reception. In fact, science can be made to represent either: "[t]aken as a whole, then, science would appear not to be (just) one or the other, but rather a set of potentials and possibilities towards both" (Locke, 2005, p. 28). Locke considers science fiction to be a forum for discussion of the questions and issues science and technology raise, rather than a unidirectional communique that tells the public that science is rational or magical. Benjamin Bates (2005), similarly, agrees that science fiction has influence on attitudes, but rejects the notion that it has a deterministic effect on audiences.

Roslynn Haynes, who literally wrote the book on representations of scientists in Western literature, contends (as stated in her opening paragraph) that, "Popular belief and behaviour are influenced more by images than by demonstrable facts" (Haynes, 1994, p. 1), and that negative stereotypes of scientists go hand in hand with Western society's uncomfortable dependence on science. She argues that the scientist stereotypes made readily available through fiction grant publics "a convenient shorthand" enabling instant intuitive assessment of real life scientists and their research (Haynes, 2003, p.

244). Particular to the threats posed by science is that they are *knowledge* threats, and once discovered cannot be undiscovered, in contrast with oppressive political regimes which can be overthrown and thus eliminated (Haynes, 2003). This suggests that while fiction may not *determine* people's opinions about science, it can nonetheless be extremely powerful in cultivating emotional responses to it. Haynes' extensive research identifies seven scientist stereotypes that pervade Western literature: the secretive evil alchemist; the heroic saviour noble scientist; the eccentric and oblivious foolish scientist; the inhuman researcher who lacks concern for ethical constraints; the scientist as enlightened adventurer; the mad, bad, dangerous scientist who threatens to destroy the world; and the helpless scientist whose work gets out of their control. The scientist as adventurer — journeying through time, space and the psyche, and epitomising the moral that "bravery, endurance, optimism, and reverence for scientific knowledge would overcome all difficulties" (Haynes, 2003, p. 250) — is the category into which Haynes places the figure of the Doctor in *Doctor Who* (Haynes, 1994). She also argues that it is science's origins in alchemical traditions, reinforced through representations of alchemists/scientists in fiction, which is responsible for the obfuscating language and behavioural conventions (such as working in formulae) that exclude lay people from participating in science. This illustrates a direct relationship between fiction and the democratisation of science.

Robert Jones (1997, 2001, 2005) has further discussed the depiction of scientists in fiction. He points to the role of post-war British films in asking questions about the use and control of science and scientists' lack of concern for the consequences of their work. His analysis of contemporary published reviews of these films (Jones, 2001) reveals reviewers' engagement with such questions and their desire for dramatic resolution of the issues. In addition, reviewers' expectations of scientist characters support Haynes' (1994) argument about the power of stereotypes to guide public perceptions of science.

Television fiction generally has been advocated as an important tool that science communicators should use to promote the public awareness of science. The Earthwake project was established to investigate new ways of using the medium for this purpose (Earthwake, 2007). More specifically, the British and European science communication advocacy bodies PAWS and EuroPAWS developed the EuroWistdom project to fund television drama scripts that feature female characters who are scientists, in order to

combat stereotyped and sexist notions of who scientists are, and to actively institute positive role models for women and girls interested in science (EuroPAWS, 2007). Along these lines, Margaret Wertheim has suggested that a woman playing the Doctor in *Doctor Who* would help redress the impression that science and mathematics are male pursuits unsuitable for girls (Cook, 2006), and a consortium of female scientists fruitlessly demanded a female Doctor when the role was being re-cast in 2008 (*The Telegraph*, 2008). Jocelyn Steinke's meticulous research (reviewed in Steinke, 2005) has built on the work of many others to show the critical importance of media role modelling for influencing girls' and women's participation in science careers. Marilee Long and colleagues (2001) have documented the poor representation of scientists belonging to ethnic minorities in children's television. Analysing the representation of scientists within *Doctor Who* can thus help us understand the work it is doing to make careers in science seem accessible and desirable to marginalised peoples.

Glenn Flores' (2002) study of representations of physicians in 131 films mostly from Western countries reveals an alarmingly high bias towards representing doctors as male (85%) and white (91%), with representations of female and ethnic minority doctors declining since the 1980s/1950s respectively. These numbers do not reflect real world proportions of male and white doctors (Flores, 2002). Eva Flicker (2003) notes that representations of scientists across all media are 82% male, although science fiction is the genre with the greatest proportion of female scientist characters. Flicker identifies six stereotypes of female scientists in her survey of 58 films, none of which correspond to the stereotypes expounded by Haynes because their diagnostic traits are inherently gendered. Each stereotype displays one or more of: the incompatability of femininity and intelligence; the incompatibility of femininity and professional success; a work obsession that leaves the scientist lonely and in need of male intervention; the abuse of feminine wiles and attractiveness to manipulate men; or the solving of problems through 'feminine' qualities such as intuition. Flicker argues that even though female scientist characters have become stronger and more independent in films since the 1990s, they are still invariably dependent on men and so usually play a secondary role to their male counterparts. Jones (2005) similarly found that female scientists in post-war British films have their own stereotypes different from those of male scientists: they are typically a romantic interest, they occupy subordinate roles to men, and they are invariably called 'Miss' rather than 'Dr' (and 'Miss' not 'Mrs' - as love interests these characters are never married). Steinke (2005) also observed a love interest theme

in 20 of the 23 films she studied. Flicker (2003), Jones (2005) and Steinke (2005) all point out that female scientist characters are usually markedly younger than is likely given their supposed qualifications, and almost always beautiful or sexualised (or are transformed from ugly to beautiful). Steinke (2005) is critical of this, but suggests that it may in fact help girls to overcome their distaste for pursuing careers in science, a claim that some female scientists have agreed with (Chimba and Kitzinger, 2009; Haran et al., 2008). However, given the subtle but pervasive culture of violent, gendered alienation women face when actually entering careers in science, technology and engineering (WISET, 1995), on the whole it is unlikely that the insistence on female characters being young and beautiful will help very much, as Steinke admits. Given these findings it is critical that fictional representations of scientists work to combat stereotypical portrayals of female scientists.

In John Hartley's discussion of the history of teaching in European society he notes that until the 17th century, teaching was carried out in three places: the family (forming selves), the workplace (forming roles) and the church (forming souls) (Hartley, 1999). He contends that in modern secular societies, television is one of the substitutes for the teaching role of the church, in part because of its oral (as opposed to print) orientation. He believes that television teaches the formation of identity and citizenship. "If TV is teaching," he writes, "then the questions of what is being taught, to whom, and with what outcomes, are interesting to investigate" (Hartley, 1999, p. 46). Margery Hourihan (1997), too, articulates the power of fictional texts to shape young minds:

> Stories are important in all cultures [...] They are the most potent means by which perceptions, values and attitudes are transmitted from one generation to the next. All teachers know the power of stories as educational tools. They are vivid, enjoyable, easily understood, memorable and compelling. They appeal to people of all ages, but for children who have not yet achieved the ability to reason abstractly they provide images to think with. (Hourihan, 1997, p. 1)

Research into the impact of rhetorical frames on public attitudes to controversial technologies is revealing here. Cobb's study of the rhetorical framing of nanotechnology showed that survey respondents were less likely to trust statements whose ideological commitments were obvious with no evidence to back them up, but

when the same statements were augmented with material framed as 'evidence', trust went up (Cobb, 2005). This was the case regardless of the ideological position taken. Hourihan (1997) notes that this is a common audience response to material that is too obviously didactic. Other studies have highlighted the adverse impact that perceptions of vested interest have on trust (Frewer et al., 1999). It may be that fictional stories that disguise ideology as narrative, or science fiction stories that disguise ideology as scientific fact, have a greater chance of subtly influencing viewer ideology than do non-fiction arguments that explicitly address questions of ideology.

In summary, science fiction has been found to influence publics' attitudes to the ethics of scientific research and technological development. It can affect choices to pursue careers in science through the role modelling provided by scientist characters. It can influence publics' ideas of what science is. It can affect their understanding of scientific concepts. And it can be a forum for playing out the dynamics of all of these ways in which publics form relationships with science. Analysing what science fiction is saying about science is thus an important task for science communicators.

In the remainder of this chapter I look at what scholars have said about *Doctor Who*'s representations of science.

Introduction to *Doctor Who*

Production terminology

Before proceeding to the more interesting discussion of *Doctor Who*'s content, it is necessary to introduce some terminology and parameters.

According to BBC terminology, there have been two series of *Doctor Who*: the classic series, which ran for 26 years (1963-1989), and the new series, which has so far run for five years (2005-2009), with production scheduled to continue at least through 2010. The classic series contributed 159 distinct serials (701 episodes) to the program.[8] The new series, to the end of 2008, added 43 serials (56 episodes). In 2009 production was

[8] The episode count for the classic series includes *Resurrection of the Daleks* and all of Season 22 as 45 minute episodes, the format in which they were originally broadcast in the UK. However, they have been broadcast elsewhere, including in Australia, as standard 25 minute episodes, which would bring the count up to 716 episodes.

reduced to three specials which are not discussed in the thesis because of the timing of their broadcast in relation to my research schedule.

During the sixteen year lull between the series, a number of *Doctor Who* stories were produced in other formats. A television movie was made in 1996 that has since been incorporated into the official BBC *Doctor Who* canon. Referred to as 'The TV Movie', it was an American co-production and featured the only canonical representation of the Eighth Doctor (BBC, 2009a). Many novels, audio-stories, charity shorts and spin-off series were produced during this time offering new adventures of the *Doctor Who* characters, and are still being produced today (and indeed were produced during the production era of the classic series), but their canonicity is uncertain and I do not discuss them here. The canonicity of the TV Movie has long been debated by fans[9], and its production values are very different from the television series proper, so I do not discuss it either. My materials for the thesis are therefore the 201 broadcast television serials from the classic series and the new series, 1963-2008.[10]

Not all the *Doctor Who* serials from the classic series remain in existence. The visual footage of 27 of them was destroyed in part or entirely by a BBC warehouse clearout in the 1970s (Richards, 2005). All were from the period 1963-69. The most badly affected were Seasons 3-5 which lost 70 per cent of their episodes, affecting 22 out of 26 stories. The audio tracks are still available for all 27 'lost stories', and have been transcribed and posted on the web (Earthbound Timelords et al., 2007). Some stories have been released on VHS with linking narration (*The Reign of Terror*, *The Tenth Planet* and *The Ice Warriors*) or DVD with animated visuals (*The Invasion*) to cover the missing episodes, and existing episodes of some other lost stories have been released in the DVD boxset 'Lost in Time' (BBC Worldwide, 2004)[11]. I have used these resources to analyse these stories bearing in mind their limitations.

Doctor Who itself is a television series, but I use the words 'program' or 'show' for it instead of 'series' to minimise confusion over the word 'series', which is already

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[9] For example, in the television series *Queer as Folk* (1999-2000), created by new series *Doctor Who* head writer, Russell T Davies, the central character Vince Tyler — a *Doctor Who* fan — claims that the Eighth Doctor "doesn't count", and has taught his best friend (a non-fan) to say this. For more extensive evidence of this claim, readers are invited to search the web.

[10] I use the qualifier 'broadcast' because the 1980 story *Shada* was not completed until 2003, and so was never broadcast as part of the series proper.

[11] 'Lost in Time' includes one or more episodes from *The Crusade*, *The Daleks' Master Plan*, *The Celestial Toymaker*, *The Underwater Menace*, *The Moonbase*, *The Faceless Ones*, *The Evil of the Daleks*, *The Abominable Snowmen*, *The Enemy of the World*, *The Web of Fear*, *The Wheel in Space* and *The Space Pirates*.

confusing. Aside from the classic series / new series distinction, within the new series, each year's programming is officially referred to as 'Series 1', 'Series 2' and so on. I use these terms in the absence of others. The classic series terminology is less confusing: each year's programming is referred to as 'Season 1', 'Season 2' etc, and within each season there are a number of 'serials' or 'stories', most of which have a single unifying name and narrative (*The Ark in Space*, *Genesis of the Daleks* etc). Each serial of the classic series is further divided into between one and 12 'episodes' or 'parts'. There is some confusion about serial names from the first 25 *Doctor Who* stories because each episode was given a unique title rather than simply an episode number, but I use the serial names that the BBC website uses (BBC, 2009a) and number rather than name episodes. The new series follows a different format and most new serials only have a single episode, although some have two or three; nonetheless, since episodes rather than serials have identifying names, I use them instead. Serial and episode names are italicised in the text. Appendix A details a chronological list of serials. Figure 1 outlines a schema of these terms.

On-screen action

The premise of *Doctor Who* is that an alien man, the Doctor (*never* called 'Doctor Who'), has run away from his home planet in a 'borrowed' ship, the TARDIS. The TARDIS looks like a 1950s British police box because its 'chameleon circuit' — designed to disguise it wherever it is parked — got stuck in the first episode when the Doctor visited 1963 London. TARDIS stands for Time And Relative Dimension(s) In Space, and it can travel in time and space.

The Doctor is a Time Lord from the planet Gallifrey, and as such, possesses ancient and sophisticated knowledge of the universe, including how it works (science) and how best to operate within it (ethics). As an anti-establishment figure who ran away from his responsibilities, the Doctor is also often irreverent or silly, and acquires various affectations such as playing the recorder badly or eating jelly babies from a paper bag. He also sometimes exhibits randomly acquired skills such as Venusian Karate, and carries unusual implements such as his famous 'sonic screwdriver', which was for unscrewing screws when it was first introduced but later expanded to serve many other functions. He claims to abhor violence, routinely advocating non-violent methods of

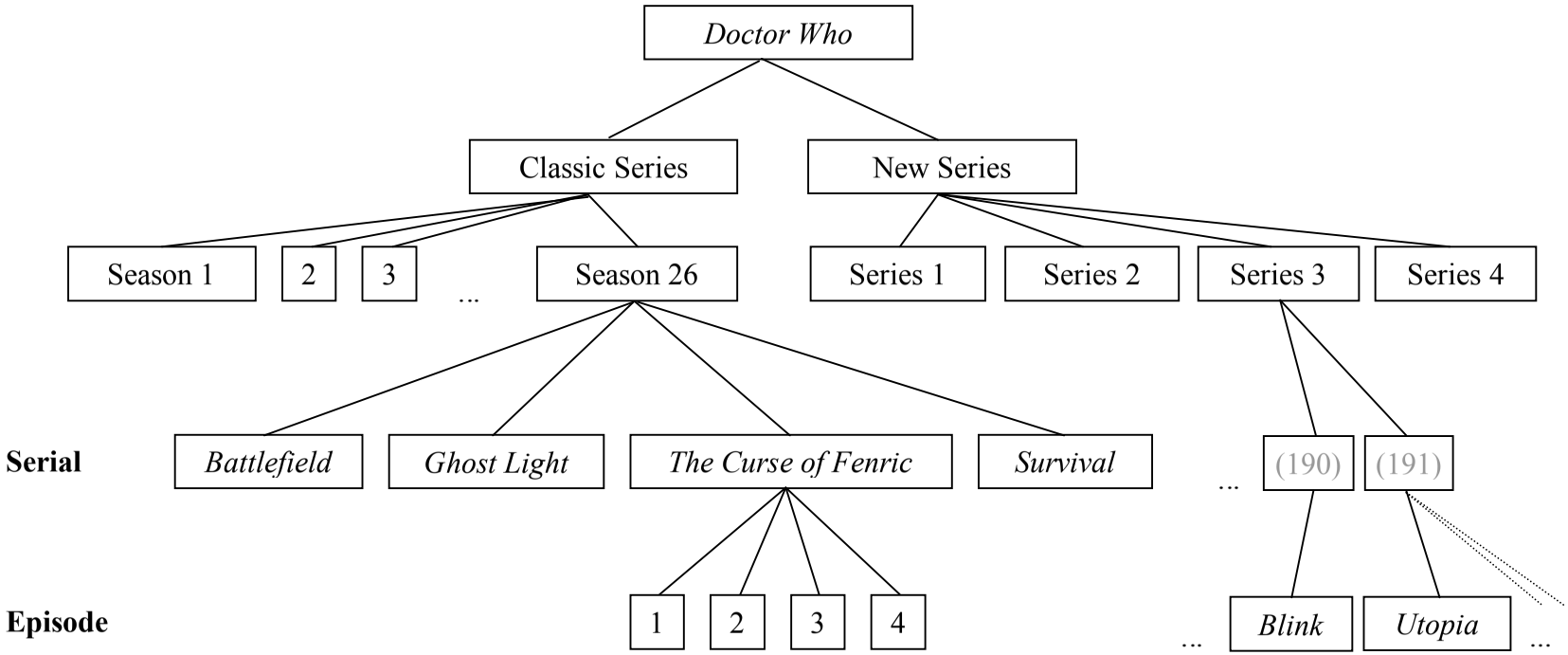

Figure 1. A schema showing the relationship between series, seasons, serials and episodes in *Doctor Who*.

conflict resolution. He is usually firm in his commitments to particular beliefs about what is and what is not acceptable behaviour.

In the classic series, the Time Lords are an ancient race of beings who invented time travel and consider themselves to be moral guardians of the technology, preventing the misuse of time travel, but otherwise professing to a policy of 'non-interference'. The Doctor occasionally begrudgingly acts as their agent in meeting their moral ends, with which he sometimes agrees. The Time Lords possess mild psychic power, and on one occasion the Doctor remarks that in many ways they have 'the same mind'. At the start of the new series, the Time Lords have been all but wiped out in a Time War (unseen), and the Doctor initially believes he is the sole survivor.

As a Time Lord, the Doctor has the ability to regenerate should he be 'killed': instead of dying, he takes on a new appearance, and is subsequently played by a different actor. The most recently cast Doctor, played by Matt Smith (2010-), is his eleventh incarnation. Prior to Smith, the Doctor was portrayed by William Hartnell (1963-66), Patrick Troughton (1966-69), Jon Pertwee (1970-74), Tom Baker (1974-81), Peter Davison (1982-84), Colin Baker (1984-86), Sylvester McCoy (1987-89), Paul McGann (the 1996 TV Movie), Christopher Eccleston (2005) and David Tennant (2005-2010). Each incarnation is referred to in commentary as 'the First Doctor', 'the Second Doctor', etc up to 'the Eleventh Doctor', or alternatively 'Hartnell's Doctor', 'Tennant's Doctor', the 'Pertwee era', and so on. Within the program's universe — commonly called the Whoniverse — all incarnations are simply called 'the Doctor', making for entertaining confusion on the few occasions when his different incarnations meet.

The Doctor is usually accompanied by one or more companions, who travel with him in the TARDIS. Companions are regular characters distinct from other allies with whom the Doctor has adventures from time to time. Of the 37 companions seen to date, 22 were women, 13 were men and two were robots voiced by men. Twenty-two were humans from contemporary Earth, all but three from England. Three were humans from Earth's past and five were humans from the future. Seven were not human: two Time Lords, the two robots and three alien humanoids. Until the new series of *Doctor Who*, all companions were played by white actors.[12]

[12] Some sources consider Sara Kingdom from *The Daleks' Master Plan* to be a companion because she travelled in the TARDIS. Since she only appeared in that one story, I consider her to be simply an ally in agreement with the

Dramatically, the function of companions is threefold: (a) to scream and be rescued, (b) to enable the plot to be explained to viewers, and (c) to provide a point of identification for viewers. Some (often male) companions can also have an action hero 'running and punching' function to compensate for the Doctor's pacifism (Tulloch and Alvarado, 1983). A companion is, in the words of *Doctor Who* producer Barry Letts (1970-1974):

> Somebody who could say 'Doctor, what is all this about?' So that the Doctor could then say, 'Oh well, now in simple terms it is so and so...' — you see, to explain to the audience what is happening. (in Tulloch and Alvarado, 1983, p. 209)

Producer Graham Williams (1977-80) expressed a similar view:

> The function of the companion I'm sad to say, is and always has been, a stereotype. The companion is a story-telling device. That is not being cynical - it's a fact. You have to have her there. It is a very cardboard figure. (in Tulloch and Alvarado, 1983, p. 209)

Accordingly, when producer John Nathan-Turner (1980-89) took the reins, he eliminated two companions, the brilliant 'Time Lady' Romana and the computer dog K-9, because they were too intelligent, and he felt that this was antithetical to the companions' *raison d'être* (Tulloch and Alvarado, 1983). Letts too admitted to eliminating scientist companion Liz Shaw because, "when anything came up, she discussed it with the Doctor more or less as an equal. We didn't have anybody who could say, 'Doctor, what's all this about?'" (Tulloch and Alvarado, 1983, p. 212).

Doctor Who has a number of recurring villains, including the Daleks, the Daleks' creator Davros, the Cybermen, the Sontarans, the Nestenes and Autons, the Doctor's former school chum and arch enemy the Master, and the essence of evil the Black

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BBC (BBC, 2009a), although her eight episodes across diverse settings and plotlines qualify her as a pseudo-companion for discussion purposes. I apply the same logic to the assessment of Astrid Peth and Mr Copper from the new series' *Voyage of the Damned* and to Jackson Lake and Rosita from *The Next Doctor*, who are merely allies. Conversely, I favour an interpretation of Jackie Tyler as a companion from *Army of Ghosts* onward, although she is not listed as a companion by the BBC (BBC, 2009b; but see discussion in TARDIS Index File, 2008). I here include the Brigadier, Benton and Yates as companions following the BBC (BBC, 2009a). River Song (*Silence in the Library*) is indisputably a former companion from the Doctor's future, but not knowing her relationship with the Doctor in her past, I here treat her as an ally. I count the two incarnations of Romana as one companion. These matters do not make a substantial difference to the analysis but are of great importance to the *Doctor Who* community, so for credibility's sake I have made my decisions explicit.

Guardian. All of these bar the Black Guardian have appeared in both the classic and new series. These villains, particularly the Daleks, have contributed to the popularity of the program, and like many of the non-recurring villains, they provide an inhuman counterpoint to the Doctor and the companions which enables a morality tale to be told. While *Doctor Who* started its life aiming to be informative and educational, it quickly gained a moral flavour which has come to dominate the program to greater or lesser extents throughout its evolution. In the words of BBC Head of Drama, Shaun Sutton (1967-81): "I think the reason for the success of the show is that it's got a quality of moral indignation. Beneath the entertainment is a concern for real issues" (Hulke and Dicks, 1972, p. 8).

Thorough reviews of *Doctor Who* may be found elsewhere in a large number of works (including BBC, 2009a, 2009b; Chapman, 2006; Cornell et al., 1995; Howe, 1993; Howe and Walker, 1998, 2003; Hulke and Dicks, 1972; Leach, 2009; Lyon, 2007; Richards, 2005; Sullivan, 2009; Tulloch and Alvarado, 1983). Appendix A gives a serial-by-serial list of the appearances of the Doctors and companions. Major crew roles are listed chronologically by serial in Appendices A (producers and script editors) and B1 (directors and writers). Appendices B2 and B3 list serials by writer and director names, showing authorial contributions to the program at a glance. Appendix C sorts serials and episodes alphabetically by title to enable easy cross referencing of the titles I mention in the text with Appendices A and B.
Having introduced the program's basics, I next review the literature on *Doctor Who* to glean what others have said about its science content, science ideology and representations of democracy.

Doctor Who: the literature

Little has been written specifically on *Doctor Who* from an academic perspective, less still has dealt in detail with its scientific ideology, and almost nothing has addressed it within the discipline of science communication. It was always made on a low budget with famously poor special effects and wobbly sets, it was first developed as a children's show, and it is not American: any of these may be the reasons why academics have not taken it as seriously as *Star Trek* as discussed by David Butler (2007a). No

doubt the popularity of the new series will revive academic interest in the show, as is already in evidence (Charles, 2008; Cranny-Francis, 2009; Leach, 2009).

What has been written is almost all from cultural studies or the related disciplines media studies and television studies. A list of much of this literature may be found in Butler's select bibliography (2007b). Cultural theorists have written about such matters as *Doctor Who*'s British identity and its relationship with the USA (Cull, 2001, 2005); the phenomenon of the Daleks and notions of 'quality television' (Bignell, 2005); and the show's genre as science fiction melodrama (Oglesbee, 1989). While interesting, these sorts of topics are not relevant here. Some of the cultural studies material is peripherally relevant though, because it looks at the program's political influences. For example, Peter Gregg (2004) looks at the significance of British identity in *Doctor Who*, but his focus on the 1974 story *The Ark in Space* highlights the social context of the story's production in terms of representations of anti-authoritary rebellion and the political movements and social discontent of Britain in the 1970s.

Restricting myself to the relevant literature, in this section I begin with a glimpse into *Doctor Who*'s origins as an educational science-oriented show for children, and go on to review the scholarship discussing its science content and political bent with specific reference to those few works that link its political ideology to science.

Science edu-tainment?

Doctor Who was in the first instance the brainchild of the BBC's Head of Drama, Sydney Newman, who commissioned its production in 1962-3 (Richards, 2005). Newman's idea was to fill a blank timeslot in the Saturday afternoon BBC1 schedule with progressive and informative children's entertainment, or as it might be called today, edu-tainment. He reflected later:

> as a children's programme, I was intent upon it containing basic factual information that could be described as educational, or, at least, mind opening for them [...] All the stories were to be based on scientific or historical facts as we knew them at the time. (in Hulse and Marcus, 2009)

The original premise of the show was that a mysterious character, called simply 'the Doctor', travelled through space and time with a group of ordinary humans from the 1960s, and through their adventures, exposed viewers to elements of science and history. *Doctor Who*'s first producer, Verity Lambert (1963-65), described Newman's vision thus:

> He was trying to find something which took into account the new things that fascinated kids, like space and other planets, and certainly he felt that he wanted a programme which, while not necessarily educational as such, was one which children could look at and learn something from. In the futuristic stories they could learn something about science and in the past stories they could learn something about history in an entertainment format. (in Tulloch and Alvarado, 1983, p. 39)

Newman's hand-written comments on early scripts reflect his desire to ground the show in real world science:

> I don't like this much - it reads silly and condescending. It doesn't get across the basis of teaching of educational experience - drama based upon and stemming from factual material and scientific phenomena and actual social history of past and future. Dr. Who does not have a philosophical arty-science mind - he'd take science, applied and theoretical, as being as natural as eating. (in Hulse and Marcus, 2009)

The BBC Script Department's writer/adapter, C.E. 'Bunny' Webber, who was also involved in the program's early development, had a softer approach to the science in *Doctor Who*:

> we are not writing science fiction. We shall provide scientific explanations too, sometimes, but we shall not bend over backwards to do so, if we decide to achieve credibility by other means. [...] Neither are we writing fantasy: the events have got to be credible to the three ordinary people who are our main characters, and they are sharp-witted enough to spot a phoney. (in Hulse and Marcus, 2009)

Webber's comments prioritise realist drama over educational science. Nonetheless, the science was in there. University of London medical scientist, Kit Pedler, functioned as a science advisor to the program during seasons 3 and 4 in the 1960s (BBC, 2009a; Salusbury, 2006). Pedler also wrote three serials for *Doctor Who* and proposed storylines for three others (Appendix B), inventing one of the most famous races of *Doctor Who* villains, the Cybermen, in the 1966 story *The Tenth Planet*. The genesis of the Cybermen was unequivocally 1960s science, as he explained:

> At the time I was obsessed as a scientist by the differences and similarities between the human brain and advanced computer machines and I was thinking that although I could easily imagine a logical machine reasoning to itself and manipulating events outside it, by no stretch of the imagination could I visualise a machine producing a poem by Dylan Thomas. And so the Cybermen appeared. (in Tulloch and Alvarado, 1983, p. 45)

Lambert has stated that in the beginning, the production team went to great pains to ensure the accuracy of historical and scientific facts as they were known at the time. She was equivocal about their success at this task though, reflecting (in agreement with Webber), "We did *try* to put some kind of scientific thing in, but the stories were much more purely entertainment I think than science" (in Tulloch and Alvarado, 1983, p. 42). Whether or not it succeeded at representing real science in an educational sense, *Doctor Who* has always engaged with science as a subject in one way or another. Tulloch and Alvarado (1983, p. 41) note that, "To an important degree *Doctor Who* has avoided the 'science as education' problem by drawing on the 'soft' socio-cultural scientific speculation associated with its Wellsian time-travel model." This is an important distinction, because it is precisely socio-cultural scientific speculation that opens up the possibilities for science fiction to engage actively with the questions of progress and enlightenment that are central to the democratisation of science. A more straightforward representation of science being "as natural as eating" (in Newman's words) would be more limited in the work it could do for the democratisation of science, since it is already commited at least to scientism.

Despite this 'soft' approach to science, science communicators have seen real science in *Doctor Who* and written about it. I refer to the two 2006 books mentioned in Chapter 1:

Paul Parsons' *The Science of Doctor Who* and Michael White's *A Teaspoon and An Open Mind: The Science of Doctor Who*.

Parsons' book compares *Doctor Who*'s science ideas and its technological gadgets with real science philosophy and technological research. A BBC science communicator, Parsons places his book in the tradition of *The Physics of Star Trek*, and like that text, the book offers a fun inroad to 21st century science. As far as explorations of contemporary science go, it is respectable and critically acclaimed as already mentioned. The book does not contextualise *Doctor Who* science in ideological or political terms though. In fact, it subsumes some of the political aspects of the show within the domain of science fact. For example, it explains the Doctor's altruistic tendencies in terms of evolutionary biology:

> He's altruistic because he feels deep down inside that it's the right thing to do, not because he expects something in return. Isn't he? Professor Christopher Wills, a biologist at the University of California in San Diego, disagrees. According to Wills, the Doctor, and anyone else who feels 'warm inside' when they do the right thing, is simply experiencing a psychological reward mechanism that our brains have evolved in order to make us more altruistic [...] So the fact that the Doctor is a nice chap boils down to being nature's way of keeping him and his genes alive. (Parsons, 2006, pp. 9-10)

This commentary is guilty of the sort of lack of reflexivity that Wynne (1993) wrote about. That science subordinates social explanations for political behaviour to biological ones is a discussion for another day, but in itself it represents a scientistic ideological perspective which claims science as 'fact' in opposition to social science explanations for altruism as 'mere' philosophical epistemology.

But is Parsons' biologism a reflection of *Doctor Who*'s own ideological commitments? Certainly, some sectors of the *Doctor Who* viewership enjoy *Doctor Who* for its scientistic aspects. John Tulloch conducted focus groups with *Doctor Who* fans in 1981, and found for one group:

> it was clear that [...] the ideological dominance of technological rationalism generated real pleasure for the fans. Their sense of the Doctor was as a modern-day knight bringing the 'new principles of physics and mechanics' to the post-medieval world. [...] [T]hese are the liberal believers in a universal, rational society; [...] their Doctor is the hero of enterprise, innovation and technology 'liberating static, isolated, feudal societies'. The Doctor, they say, unlike his Time Lord race, is 'prepared to use their technology', thus protecting the 'weak and the ignorant' against the 'overdominant and the strong'. (Tulloch and Jenkins, 1995, p. 60)

This 'ideological dominance of technological rationalism' is also evident in the book on the science of *Doctor Who* by White (2006). White is concerned with answering theoretical questions about the possibilities of time travel, alien civilisations, regeneration and so on, but he too lays bare his ideological commitments about science. For example his statement, "An appreciation of science [...] helps us to believe that almost anything is possible" (White, 2006, p. xii), reflects a cornucopian rather than conservative humanist attitude to science (Cobb, 2005).

White also discusses the notion of 'superraces': an alarming turn of phrase by which he means highly technologised civilisations. White contends that:

> The onward march of any culture is inevitable; a civilization that stops developing can only stagnate, and stagnation leads inexorably to extinction. No civilization can remain in stasis. Of course, the quality of a civilization is not demonstrated solely by the level of its technology. We might also judge a culture by its art and its political systems, by the rights of its citizens and by the way it behaves towards other societies. But for the exobiologist the primary interest is to quantify the level of technology and scientific advance of an alien culture, and this has led them to categorize civilizations accordingly. (White, 2006, pp. 100-101)

The language here is developmentalist: *a civilization that stops developing can only stagnate*. White links notions of technological development and 'scientific advance' to notions of cultural change preventing 'stagnation'. He may be unaware of cultures (for

example in Australia) that have survived millenia while valuing tradition, custom, the maintenance of ancient knowledge and the sustainable stewardship of environment as well as technological adaptation: societies that change but have not (until recently) changed according to Eurocentric expectations mirroring Western 'development'. White's qualification that there are multiple possible grounds on which to assess the 'quality' of a civilisation makes it look as if he is not privileging Western 'progress'. But his unreflexive, unsubstantiated statement that exobiologists are more interested in technologisation and science than art or politics undermines this impression.

White goes on to describe (uncritically) the exobiologist classification scheme for 'civilisations' (White, 2006, all quotes from p. 101). It contains four categories. 'Type 0 civilisations' are "primitive cultures, in which the population is dispersed and there is little or no social structure". 'Type I' are "those that have developed to the point where they can exploit the natural resources of a single, home world" — White notes that this includes 'us'. 'Type II civilisations' can exploit the full energy of the sun, while 'Type III' "would be millions of years ahead of us" and can use the entire resources of their galaxy. White says, "Although we view the technology employed by a type III culture as almost omnipotent [...] It's just that they have had more time to develop".

All of this begs deconstruction. The use of the word 'primitive' is suggestive of White's lack of reflexivity regarding the complexity of existing human non-Western cultures. By placing 'us' in the 'Type I' category, he Eurocentrically conflates *Western* with *human*, implicitly denigrating as inferior or lagging behind human cultures that do not exploit the resources of the home world. It is also interesting to note that the diagnostic traits of 'Type 0 cultures' have nothing to do with technology and science whatsoever despite White's initial statement about the interests of exobiologists; another unexamined Eurocentric conflation of non-Western social structures with scientific and technological 'backwardness'. He also falls into the trap Heidegger ([1954] 1977) identified: considering technology to be an ideologically neutral tool, while simultaneously naming the universe 'standing reserve'. 'Exploitation' of 'natural resources' is the name of the science and technology game: yet another Eurocentric assumption. White's final statement about 'Type III cultures' as 'simply having more time to develop than us' seals the deal: 'type III' is where we humans are destined to go, or else become extinct through stagnation. White's philosophy is stagist, ticking off human cultures on a predetermined trajectory of developmental inevitability that he has

unreflexively derived from racist Eurocentric Enlightenment assumptions. There is no room for the democratisation of science in this view. Any step outside of the 'progress' model to which he subscribes will, according to White's rules, lead to extinction.

Again, the question must be asked: does this only represent White's authorial perspective, or is this set of ideas present in *Doctor Who* itself? Certainly, the reason why White addresses these questions is because of *Doctor Who*'s representation of technologically 'advanced' 'superraces' such as the Time Lords (White, 2006). If Western science was born or reborn in the Enlightenment as discussed in Chapter 2, and if *Doctor Who* aims to represent real world science ideas, then it would not be surprising to find these aspects of Enlightenment ideology in the program. Other scholars dispute this though, including John Tulloch and Manuel Alvarado (1983, p. 45), who wrote: "In the absence of a 'serious' science, the emphasis on human values and aspirations *against* the mechanistic rationalism of science [took] over as a central theme of *Doctor Who*". Script editor Terrance Dicks (1968-74) said this about *The Monster of Peladon*, a story which dealt with such questions:

> [Y]ou can't just do a kind of old imperial story whereby the galactic federation is coming to Peladon and is bringing the simple natives the benefits of civilisation [...] We are all well aware now that what happens when an advanced race meets a primitive race is not always to the benefit of the primitives [...] Obviously the miners [belonging to the 'primitive' race] would resist the technology because it wouldn't be what they were used to and they would be frightened by it and it might put some of them out of work . . . Obviously the ruling establishment would try and latch on to the technology and try and see what benefits were going to come from civilisation . . . This is the kind of thing that now happens in real life. (in Tulloch and Alvarado, 1983, p. 53)

While Dicks' statements are on one level consciously anti-colonialist, nonetheless his terminology of 'advanced' and 'primitive' races reveals a developmentalist outlook. White may not be on his own here in defending stagist inevitability, if it consciously or unconsciously enters the text of *Doctor Who*.

Aside from Parsons' and White's books, only one paper in the science communication literature has dealt with *Doctor Who*. It is Jones' (1997) discussion of the boffin stereotype in post-war British films. Jones mounts a hesitant argument to include some incarnations of the Doctor within the boffin mould. He specifically names Pertwee's Doctor because he spent time as scientific advisor to the fictitious United Nations Intelligence Taskforce (UNIT), and so on occasion helped the military to build weapons to fight the enemy, which is basically the definition of a boffin as Jones describes it. But the focus of Jones' paper is postwar British films, and *Doctor Who* only makes it because of the two *Doctor Who* movies made in the 1960s that starred Peter Cushing as the Doctor, and these are generally not considered to be canonical. Even then, the *Doctor Who* discussion comprises only one short section of the paper.

This means that overall, the science communication scholarship on *Doctor Who* is very sparse indeed, leaving plenty of questions unanswered. As noted though, the cultural studies scholarship is more extensive, and it also deals more explicitly with questions of *Doctor Who*'s political and science ideology. It is reviewed next.

Science fiction for democracy?

Tulloch and Alvarado (1983), Fiske (1984), McKee (2004), Charles (2008) and several authors included in the volume edited by Butler (2007b) all deal with the political content of the classic series of *Doctor Who*. So far, only a few scholarly works, including some of those in Butler (2007b), have discussed the politics of the new series in any depth, although it seems likely that more will appear soon.

Tulloch and Alvarado's (1983) book *The Unfolding Text* is held in high esteem by scholars of *Doctor Who* as the most comprehensive scholarly treatment of the program in its history (see Butler, 2007b and references therein). *Doctor Who* script editor Andrew Cartmel (1987-89) encouraged his scriptwriters to read the book (BBC, 2009a), although he also referred to it as "very pretentious" (Chapman, 2006). The 1987 serial *Dragonfire* even includes short passages from the book in dialogue; amusingly, one such passage dense with cultural studies terminology is seen to befuddle the Doctor

himself.[13] Parts of the book were first published elsewhere (Tulloch, 1982) and others later elaborated on in another book (Tulloch and Jenkins, 1995). But *The Unfolding Text* remains the core text for deconstructing *Doctor Who*'s cultural meanings over its first 20 years, not least because of the extensive original source material it cites including interviews with key production personnel.

In one such interview, the Pertwee-era producer/script editor team of Letts and Dicks revealed their political leanings as liberal-left "because that is the most intelligent position to take" (Tulloch and Alvarado, 1983, p. 54). Interestingly, Dicks named his own leaning 'realist' rather than 'political' in what may be a fascinating instance of an unreflexive de-ideologisation of political belief. Tulloch and Alvarado interpret this as a manifestation of the normative liberal consensus:

> [The Doctor] has consistently adopted exactly that liberal-populist role in criticising 'sectionalist' forces of 'Left' and "Right', and in rebuking the 'official' and the powerful, whether in big business, the military, government or 'militant' unions. That is possibly why Verity Lambert intuitively was uneasy with the third Doctor who lost his 'anti-establishment' character and was at risk of becoming identified with the needs of the military and government. (Tulloch and Alvarado, 1983, p. 52)

These authors assert that the primary end of *Doctor Who* is to establish and reinforce notions of what it is to be human. This is achieved through two linked normative themes: "the threat of human defilement which is opposed by the liberation of the oppressed" (Tulloch and Alvarado, 1983, p. 77). This 'threat of defilement' links to an Enlightenment Western model of personhood that values the sanctity and boundedness of the individual (Meyers, 2004), as opposed to 'dividualist' models of personhood that value connectedness (Strathern, 1988). The threat often comes from alien cultures and species that disrupt Enlightenment individualism, but this is not always the case. The threat also manifests sometimes as science — "the [Enlightenment] exploratory principle itself" — threatening 'pure', 'natural' people and planets, which Tulloch and

[13] The scene involves the Doctor trying to distract a guard by striking up a conversation about philosophy. Surprisingly, the guard responds articulately, and the ensuing conversation provides ample distraction. Objective thus achieved, the Doctor attempts to leave, but the guard corners him with a question drawn directly from *The Unfolding Text* (p 249): "Tell me, what do you think of the assertion that the semiotic thickness of a performed text varies according to the redundancy of auxiliary performance codes?"

Alvarado note provides a problematic in *Doctor Who* because the Doctor is a scientist himself (Tulloch and Alvarado, 1983, p. 94). This problematic plays out between and within scientist characters time and again in the program, as Tulloch and Alvarado suggest:

> A central emphasis of *Doctor Who* is on the pride of 'man' as scientist — grappling, sometimes with the best of motives (replenishing dwindling energy supplies), sometimes the worst motives (racial or capitalist greed), with forces which are beyond comprehension and control. (Tulloch and Alvarado, 1983, p. 94)

This in itself suggests a rich field of material in *Doctor Who* for the exploration of the democratisation of science. The conflict is routinely resolved by the show's central character, the Doctor. It works, in the view of these authors, because he is an anti-establishment rebel of a particular variety who offers a dialectical resolution of the contradictions between rationality and irrationality:

> The central distinction between the two forms of [anti-establishment] revolt in *Doctor Who* (which otherwise are united by their rejection of social hypocrisy) is between reason based on experience and intuition (the position of the ever-wandering Doctor), and manic reason as the fixed idea of controlling the universe (the position of the ever-incarcerated villains). Only the constant flux of experience, the capacity as it were, to be born again and again, can ward off this threat of the madness of rationalism. (Tulloch and Alvarado, 1983, p. 139)

This brings us back to the Hume-Kant debate over human experience versus reason in ethics. Humanism then is a dominant influence on the program, not merely in the Kantian sense of anti-transcendence, but in the Humean sense of embracing the intuitive as it emerges through experience. The Doctor is a humanist as well as a scientist. Tulloch and Alvarado sum up the philosophy of *Doctor Who* like this:

> It is that precarious balance choosing sometimes evil, sometimes good [...] which, rather than any permanent and bureaucratically designed balance, is the only truly human harmony, based as it is as much on

> intuition as reason, on the irrational and random choice as much as on scientific knowledge. (Tulloch and Alvarado, 1983, pp. 77-78)

David Rafer (2007) provides further interesting insights into the interplay of the rational and the irrational in the character of the Doctor. Because the Doctor sees the mythic and monstrous as rationally explainable, Rafer writes, he "is thus positioned as scientist-hero and generally imposes a logical worldview upon myth and the fantastic" (Rafer, 2007, p. 128). At the same time, the Doctor can exhibit an irrational, trickster persona, and Rafer argues that he "can synthesise these opposing qualities and thus rise above their individual limitations to aspire to new forms of knowledge" (Rafer, 2007, p. 130). This statement would seem to encapsulate the critical debate amongst these scholars. Does the Doctor in fact rise above it all, offering new ways forward, or does he reflect the same old oppressive ideologies?

James Chapman (2006) suggests that he rises above it, but perhaps it depends on one's perspective of what 'the oppressive ideologies' are exactly. Like Letts, Tulloch and Alvarado before him, Chapman names the program's political orientation as anti-establishment and liberal:

> The cultural politics and narrative ideologies of *Doctor Who* [...] serve to encourage difference and non-conformity. This is evident not only in the characterisation of the Doctor himself as an eccentric and a social outsider, but also in his companions who embrace class and regional (and finally, in the 1996 film, ethnic) diversity. The entire series, moreover, is imbued with an unmistakably liberal ethos. The Doctor stands for the values of liberty, freedom, equality, justice and tolerance; he is implacably opposed to totalitarianism, slavery, inequality, injustice and prejudice. (Chapman, 2006, p. 7)

These are strong words for a program which, by Chapman's own admission, often portrayed female characters in problematic ways, notably as skimpily-clad screamers. His remark about the companions' diversity is generous towards *Doctor Who* in that and other respects.[14] Nonetheless, Chapman's is a fairly popular reading of the program.

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[14] Chapman's 'ethnic diversity' statement refers to a Chinese-American character in the TV Movie called Chang Lee, who spends the film working for the Master against the Doctor so is not usually considered a companion (e.g. BBC,

It is not the only one though. In the introduction to his scholarly anthology *Time And Relative Dissertations In Space*, editor David Butler reports on the responses some viewers had to aspects of the new series when it was first broadcast in 2005 (Butler, 2007a). Comments were posted to extreme right-wing websites bemoaning the presence of a working class white woman (Rose) and her black boyfriend (Mickey) as the Doctor's new companions. In contrast, a left-wing viewer wrote a review discussing the representation of aliens in *The Unquiet Dead* as evil invaders masquerading as asylum seekers, objecting to the political implications of making such an anti-refugee statement. These comments suggest *Doctor Who*'s ideology is open to viewer interpretation, although the left-wing viewer later acknowledged that the anti-refugee statement was unintentional, thus signifying the existence of an officially intended reading. Regardless, as Butler argues, whatever else it is, *Doctor Who* is far from socially irrelevant.

John Fiske's (1984) work makes sense of some of *Doctor Who*'s apparent contradictions. His fascinating study presents a structural analysis of the representation of political dynamics represented within the *Doctor Who* serial *The Creature from the Pit* (1979). Fiske's representation of the basic structural elements of a story is reproduced in Figure 2a. He argues that the interplay of discourses is the most important relationship in the model, specifically in this case discourses of politics, economics, morality and individualism, which manifest as 'good' = liberal democracy and 'bad' = totalitarianism. Fiske makes the general point that "[a] discourse may be manifest in a text, but its origins and destinations are always social", and that reading a text is therefore identical to making sense of our social experience (Fiske, 1984, p. 169). With Hourihan (1997), Fiske notes that texts are easier to interpret than real lives, and *work* when we believe our reading of a text is adequate because we can transfer its simple message to our own complex situation. He argues that popular texts operate from a position of high consensus: *Doctor Who* audiences have high consensus that democracy is good and autocracy is bad, so heroes are portrayed as democratic and villains as autocratic. From this high consensus point, the text can expand outwards to include

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2009a). More plausibly, the class 'diversity' before the new series explicitly extended to Dodo as an intended Cockney, Ben as a Cockney, Jamie as a Jacobite Highlander, Benton as an enlisted soldier and Ace as a suburban teenager, who were all overtly marked as working class including by their accents (though in Dodo's case, the BBC deemed anything other than a BBC accent unacceptable (BBC, 2009a)). 'Class diversity' implicitly extends also to white-collar workers with little control over their labour: Barbara, Ian, Polly, Jo, Tegan and possibly Captain Yates. 'Regional diversity' can only include Katarina (ancient Trojan), Jamie (a Scot), Tegan (Australian) and Peri (American).

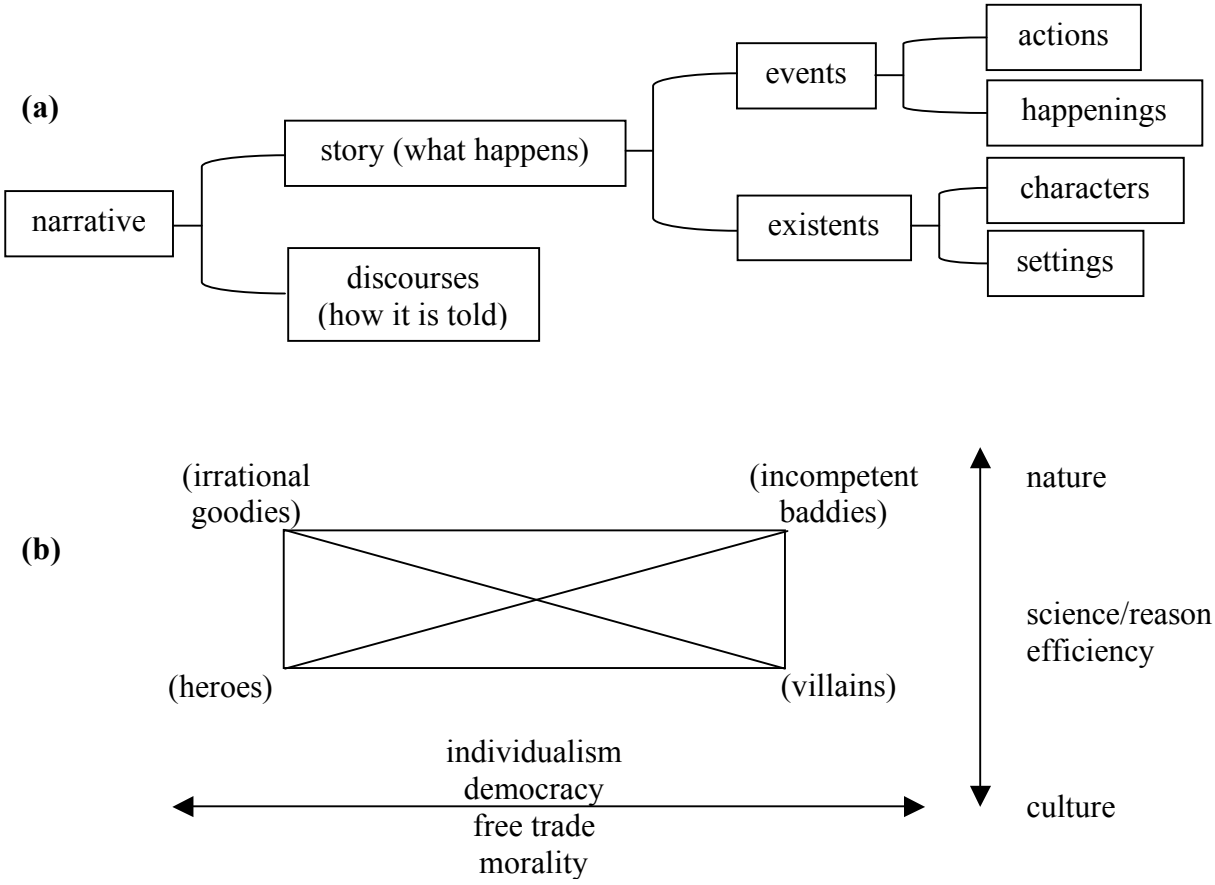

Figure 2. (a) A reproduction of Fiske's (1984) structural model of a simple narrative. (b) A modified reproduction of Fiske's (1984) model of the discursive relationships in *The Creature from the Pit.*

more controversial ideas within each high consensus umbrella. As an example, he contends that *The Creature from the Pit*'s high consensus element, 'democracy', expands to include notions of free trade and individualism. This, in Fiske's analysis, is how fiction influences publics' systems of belief.

In regard to science, Fiske agrees with Tulloch (1982) that in *Doctor Who*, pure science equates to totalitarianism:

> In story after story in Dr. Who, "pure" or "cold" science is used to maintain or establish a totalitarian political order. Science is a means of power in an intergalactic version of feudal society. The Doctor typically defeats a totalitarian, scientific antagonist and replaces him or her with a liberal democratic humane scientist to take over and bring justice and freedom to the oppressed serf class. (Fiske, 1984, p. 173)

'Good science' vs 'bad science' is a harder distinction to maintain than democracy vs totalitarianism, so linking the two dichotomies together does part of the work (i.e. 'good science' = liberal democracy and 'bad science' = totalitarianism) (Fiske, 1984). The inherent ideological problem of science fiction according to Fiske is reconciling the inhumanness of science with humanism. In *The Creature from the Pit*, this is achieved by allowing the scientist Doctor to make (minor) errors, behave childishly, embrace randomness and eccentricity and dress in a Bohemian fashion, all of which serve to establish the Doctor as individual, and therefore not merely a subject or proponent of science. The villain Adrasta asserts her power via force not individualism, hence her status as villain. Fiske ends up with a two dimensional representation that equates culture-nature with reason-nonreason on the Y-axis, and individualism, democracy, free-trade and morality (and their opposites) on the X-axis (Figure 2b, p. 68). He argues that this "structure of moral values [...] is the final naturalizing force in this ideological practice of the program" (180), so that good and bad are clearly distinguished within every structural element of the show (Figure 2a, p. 68), with monotonous repetition disguised only by an "attractive" variety of actions that add little to the overall narrative but prevent the text from becoming propaganda. The text then closes off certain ideological possibilities, leading cooperative viewers to an inevitable ideological closure, one consistent with capitalism. While readers can take a variety of messages away from the text, the variety is limited: it is not possible to form a discursive link

between free trade and autocracy (Fiske, 1984). Fiske also raises questions about representations of class and gender in this particular story.

Aside from his insights into structural elements of *Doctor Who* stories and ideological links between politics and science, Fiske's paper is useful for a point it makes about popular culture. Fiske contends that one of the defining characteristics of a popular text is "the collapsing of the difference between author and reader: the appropriate discourses by which the text is constructed and read are part of the commonsense experience of both" (Fiske, 1984, p. 187). A constructivist understanding of reader interpretation would argue that this is not correct; that in fact readers always interpret texts in accordance with their own experience rather than a predetermined common ground (Locke, 2005). However, it would be possible to mount an argument that popular culture gets around this problem with a majority of publics by building on areas of high consensus, such as stereotypically characterised democracy.

Alan McKee's (2004) qualitative examination of the political views of 39 *Doctor Who* fans and their perceptions of the politics of *Doctor Who* suggests that *Doctor Who* does not achieve this consensus. The political bent of the people McKee interviewed ranged from Marxist to extreme right, yet McKee found that they all saw in *Doctor Who* a reflection of their own political views. Almost all the fans he interviewed insisted that the Doctor has no particular political allegiances, but rather that he focuses on the circumstances of each moral quandary as it arises. McKee found that even for stories he considered to be overt political allegories, fans did not always consider them to be political at all.

McKee's is a significant finding, not least because it seems to contradict research in science communication which suggests that science fiction *does* influence viewer's attitudes to (inherently political) science issues, such as human cloning. But the more overt and obvious political discourses that are McKee's focus, such as party political allegiances, are perhaps not the same as more implicit political discourses contained within science issues. Indeed, McKee dismisses the apparent conflict between his findings and the conjectures of Fiske (1984) as the difference between explicit and implicit political identifications.

Publics' generally poor sense of ownership over science — their scientific disenfranchisement — can make science a more bewildering subject to grapple with than party political allegiances. This disenfranchisement is why publics are often influenced by the endorsements and rhetoric of 'experts' in regard to science issues, including in fictional representations of science (Slovic, 2000), rather than making their own 'rational' decisions based only on the 'evidence' (Frewer et al., 1999; Siegrist and Cvetkovich, 2000). This relationship between expert opinion and science decision is not so different from the relationship between 'high consensus political view' and 'ideological consequence' postulated by Fiske (1984). Add to this the insistence by many proponents of science that science is inherently non-political, and the ideology of science gets completely lost in a rhetoric of 'facts', 'evidence' and jargon. As Hourihan (1997) makes clear, all text is political, even if not overtly so. And as discussed above, overtly political texts are often dismissed as didactic. Since science ideology is often framed as apolitical, it is possible then that an ideology of science — for example the ideology of scientism, or a message of 'trust in scientists', or a feeling that 'technological development is dangerous' — emerges surreptitiously but ultimately more strongly from *Doctor Who* than a characterisation of the Doctor's political leanings in terms of categories such as left, liberal or conservative.

Time And Relative Dissertations In Space (Butler, 2007b) is a recent anthology to rival *The Unfolding Text* for credible *Doctor Who* scholarship. Contributions primarily focus on cultural studies topics such as the origins, genres, audiences, authorship and production of the program, but the book contains one paper that examines representations of democracy in *Doctor Who*. It is Alec Charles' essay 'The ideology of anachronism', which discusses some of the *Doctor Who* stories that engage with themes of imperialism, colonialism and the British Empire, and also contextualises the creation of those stories in relation to what were at the time very recent international political struggles (Charles, 2007). As Charles points out, *Doctor Who* began eighteen years after the Second World War, sixteen years after India won independence, seven years after the Suez Crisis and up to six years after the independence of Ghana, Malaysia, Iraq, Nigeria, Somalia, Sierra Leone, Tanzania, Kuwait, Cameroon, Uganda and Jamaica, among others. Charles recites a list of states that won independence during the early years of *Doctor Who*'s production: Kenya, Zambia, Botswana, Zanzibar, Gambia, Aden and Swaziland, among others. With a markedly different view of things than Chapman (2006), Charles goes on:

> During the programme's first season (1963-4), the Doctor and his companions used their superior technology to interfere in the internal politics of a primitive tribe ('An Unearthly Child'); recognised their kinship with a clan of Aryans and taught them the arts of war ('The Daleks'); saved the paternalist empire of a white-robed mind-controller from the liberation politics of a cell of black-clad anarchists ('The Keys of Marinus'); were careful to preserve the historical conditions that would pave the way for Cortés and Napoleon ('The Aztecs' and 'The Reign of Terror'); and, when faced with a gang of rogue colonials on an alien world, improvised a disconcertingly happy ending for Joseph Conrad's *Heart of Darkness* ('The Sensorites'). Most significantly, they did battle with the Nazi-like Daleks, in the first of a relentless sequence of reconstructions of Britain's finest hours. (Charles, 2007, p. 115)

Charles' central thesis concerns the construction of time by a colonialist mentality. He draws out the discursive links between totalitarianism and the idea of the end of time, one of the aims of empire being to freeze time over the colonies. He examines direct or allegorical representations of the British empire in *Doctor Who* with respect to this understanding of time, and concludes that one of the program's implicit goals is to reinstate the empire.

Similarly, a brief paper by Nick Caldwell (1999) explores the contradictory representations of colonialism in *Doctor Who*, arguing that the show problematically equates the fate of England (usually London) with the fate of the Earth, and has running through it various unsubtle representations of the reinstatement of the British empire via, for example, space-race technology. Further, in the context of discussing images of the hero in Western literature, Hourihan (1997) argues that the representation of *Doctor Who* villains such as the Daleks and Cybermen as emotionless, inhuman hordes is firmly within the Western literary tradition of xenophobic, colonialist discourses of cannibals. Positing emotionlessness as the characteristic that defines Daleks and Cybermen as 'not we' is simply a manifestation of 'othering' in Hourihan's view.

Fiona Moore and Alan Stevens (2007) argue for a different interpretation of the Daleks, emphasising the central role played by human (or humanoid) collaborators in Dalek stories, and thus arguing that the significance of the Daleks is in the questions they raise

about the potential for humans to do evil. Of particular interest here is their observation that this figure of the evil human changes over time, reflecting changes in societal ideas and values. The ‘evil human’ was presented as straightforwardly Faustian in the 1960s, when collaborator characters were often scientists. The location of the conflict between good and evil moved in the early '70s from an externalised ‘resistance vs collaborators’ battle to an inner turmoil within ‘evil humans’, reflecting a broader political shift in the perceived location of threats to (British) society away from foreign hostiles towards domestic discontent (Moore and Stevens, 2007). This emphasis crystallised in the humanoid-Dalek hybrid-like character of the Dalek creator Davros in the late '70s. The 1980s saw a less ‘linear modernist’ representation of good and evil in Dalek stories and embraced a post-modernist multiplicity of ‘evil human’ characters, used to explore mutliple versions of morality. Moore and Stevens argue that Dalek stories closely resemble fairytales, with their popularity and resonance across age groups stemming from a similar place because they explore the dark side of human nature, help viewers to understand tragedy and evil, and reinforce social values (Moore and Stevens, 2007). Along with most *Doctor Who* scholars reviewed here, they indicate their belief that the messages *Doctor Who* conveys have resonance for viewers and therefore have the potential to affect opinions, attitudes and beliefs.

All of this suggests that *Doctor Who* is not as straightforward in its ideology as Chapman would have it, but is in fact full of political complexities, with overt rhetoric and covert discourses not necessarily in agreement. Is it scientistic? Is it stagist and developmentalist? Is it colonialist in its science evangelism? Is it sexist in its representation of scientists? Is it telling us what to think about science and democracy through the clever manipulation of dramatic conventions or is it inviting us to question and wonder? Is it reproducing the normative commitments of liberal bourgeois democracy or is it finding a new way through to liberation? The literature opens these questions but does not agree on answers. The prevailing wind — and the argument I find most convincing — suggests it is covertly imperialist while overtly espousing a consensus liberal rhetoric; a position entirely consistent with the modern Western political system which uses imperialist war to bring bourgeois liberal ‘freedom’ and ‘democracy’ to former European colonies, and indeed with the *Declaration on Science* which at once espouses equal opportunity for all in science alongside the inevitability of a Westernised, technologised future (World Conference on Science, 1999). What is not clear is whether the Doctor’s embodiment of contradictions as noted by the scholars

challenges scientism, developmentalism, exclusivity and elitism in science, obscures it, or negotiates and articulates aspects of it in unique ways. There is still much to be written on these matters, and given the situatedness of interpretation, a consensus is unlikely to emerge. My own contribution in the following chapters is undoubtedly shaped by my own situatedness, including my political beliefs, my relationship to science, and the lens through which I view *Doctor Who*, as a long term fan already familiar with the material.

I will finish this review with a look at a book written for young viewers by *Doctor Who* scriptwriters Malcolm Hulke and Terrance Dicks: *The Making of Doctor Who* (Hulke and Dicks, 1972). It also opens questions about *Doctor Who*'s science ideology without fully answering them. Throughout the book, Hulke and Dicks emphasise the scientific nature of the Doctor's character for each of the three incarnations they discuss. "Built into his character was a scientific curiosity about everything and everywhere," they note of Hartnell's Doctor (Hulke and Dicks, 1972, p. 4). Troughton's Doctor "had the same type of mind, always wanting to find things out. He was still a scientific genius. Most important, he still hated evil and injustice" (pp 17-18). Pertwee's Doctor "loves gadgets and machinery" (20), as did Pertwee himself, they note. Hulke and Dicks allow us a glimpse into the self-consciousness of the time about technological advancement, particularly regarding space travel, writing that "our increasing scientific progress [...] let it be known to beings on other planets that Earth must be inhabited by intelligent creatures" (21). Like Parsons (2006) and White (2006), they also engage with the question of how the science and technology in *Doctor Who* might be possible in real life. They explain ideas about dimensional transcendentalism, the theory of relativity, and astrobiology with scientific thoroughness, thus pre-empting Malcolm Wicks' suggestion of using *Doctor Who* as an inroad to science literacy.

The book concludes with three pages by the Rev John D. Beckwith, Chaplain to the Bishop of Edmonton, who takes pains to discuss how science fiction is compatible with Christianity. He notes that human exploration of the universe has inspired some people to believe in God because "it helps them to see that there is so much in the Universe that could only be planned and made by someone greater than Man himself" (Beckwith, 1972, pp. 109-110). Beckwith notes also that the Bible contains documentation of cosmic happenings on Earth, which some scientists have tried to interpret scientifically. Finally he writes about the morality of *Doctor Who*:

> Doctor Who, as a character, is essentially a good man and, although even he has setbacks and the situation often hangs in the balance, Good in the end triumphs over Evil. This is perhaps the most important connection between *Doctor Who* and religion: the recognition that there is one basic Truth in God's Creation and this is that the most valuable and worthwhile thing is GOODNESS and that though this is often marred and spoilt by Man it cannot ultimately be destroyed. Evil only has the power that Man gives it, but Goodness has the power of God. (Beckwith, 1972, p. 111)

This insert is significant for interpreting the cultural place of *Doctor Who* historically. It is well to critique the program for its conservative politics or its scientism, but if it faced hostility from powerful creationists and conservative establishment figures, its shortcomings must be thus contextualised. *Doctor Who* cannot be all things to all people. To broaden young minds to new possibilities is surely a worthy end, even if the particular route taken is problematic. It is not the task of this thesis to contextualise the whole of *Doctor Who* in time and place, nor to forgive it its shortcomings, but *The Making of Doctor Who* cautions us to be gentle when reflecting on the ideological meanings of a program that has lasted nearly half a century.

In the next and final section of this chapter, I outline how I propose to assess *Doctor Who*'s contribution to the democratisation of science.

Doctor Who **and the democratisation of science**

Once again, the central question of the thesis is: To what extent are representations of science in *Doctor Who* compatible with the democratisation of science?

I want to answer this question for several reasons. Most obviously, as *Doctor Who* has been advocated as a science learning tool, it is important to understand how it might influence students' relationships to science as an institution beyond the superficial receptivity to science education that Malcolm Wicks wants to tap into. Even outside the classroom, an understanding of what this popular, long-lived, widely viewed program has to say about science can grant us insight into how science is perceived, whether

consciously or unconsciously, by the television production staff who create them. Such an understanding can help science communicators to grasp the discursive tendencies and rhetorical tools that publics make use of as a result of watching *Doctor Who*. It can help science communicators to approach the creation of science-based television fiction in ways that correct for *Doctor Who*'s mistakes. More broadly, this thesis offers a new approach to the study of science fiction's representations of science, trialing a 'democratisation of science' framework and the four key goals I have identified within that.

Specifically, I want to assess the ways in which *Doctor Who* promotes the democratisation of science by (i) granting viewers the tools to engage with scientific ideologies and issues in their daily lives, and to feel confident to intervene around science regardless of their science knowledge, (ii) granting viewers the possibility of envisioning themselves as scientists through genuinely inclusive role models, (iii) granting viewers the opportunity to make up their own minds about the ideal relationship between humanity and technology, and (iv) granting viewers critical insight into the political history, philosophy and geography of science and scientism. If all of these ends are met — if viewers are likely to walk away from *Doctor Who* feeling that science belongs to them, that they can train to be scientists, that they can decide which technologies are funded and which are legislated against or regulated, and that they are free to embrace or reject science as one and only one of the many systems of knowledge available in the world — then I will celebrate *Doctor Who* as a useful tool for promoting the democratisation of science. If none of these ends are met — if viewers are likely to feel that only clever or exceptional people can understand science, that their views on science and technology are irrelevant, that they could never be scientists because of the particular social norms that scientists conform to, and that scientism is the mark of civilisation and the sole solution to the world's problems (or alternatively, that science has nothing to offer them because of the normative political views that it is packaged with) — then I will condemn *Doctor Who* as a poor tool for the democratisation of science. These are extreme positions and the reality is likely to be something in between.

Doctor Who's dramaturgic conventions offer convenient ways to assess its success or failure in meeting the challenges of the four goals of the democratisation of science. The goals of *Franchise* and *Equality* can be assessed through the role-modelling presented

by scientist and non-scientist characters in the program. The goals of *Progress* and *Enlightenment* can be assessed through the ideological closure of science-related plot lines, both in terms of the rhetoric (dialogue) used to justify or debate the closure, and the discourses employed in the telling. Hourihan identifies the ideological closure as a crucial component of hero tales (discussed in Chapter 5), and defines it thus:

> It is the point in a text when loose ends, doubts and uncertainties are removed, and the significance of the story seems clear and coherent, the point where the myth imposes its meanings upon the reader. The closure is ideological as well as narrative and aesthetic; it makes the values inherent in the structure and narrative point of view seem to 'go without saying', to be simply natural. (Hourihan, 1997, p. 52)

Franchise

In addressing the goal of *Franchise*, I am interested in the scientist role model presented by the Doctor; the role model relationship between the Doctor and his non-scientist companions based on the assumption that the companions' function is to stand in for the audience; and plots that specifically grapple with questions of science's relationship to democracy.

Key question: Who is permitted and enabled to access, wield, critique and govern science?

Equality

In addressing the goal of *Equality*, I am interested in gender, race, class, sexuality and disability characteristics of scientist characters, particularly companions as they sit beside the white, male, privileged Doctor; and the ways in which apparent equal opportunity casting is strengthened or undermined by representations of diversity. Due to *Doctor Who*'s relatively monochromatic demographics, I focus on gender.

Key question: Who is permitted and enabled to work as a scientist or scientific expert?

Progress

In addressing the goal of *Progress*, I am interested in representations of humanity's future with respect to technology, and the relationship between political ideals, self-determination, and technologisation. I analyse the circumstances under which scientific research and development is allowed to proceed with the moral endorsement of the

editorial perspective, when it is considered dangerous, and representations of the karmic consequences of engaging in problematic research and development.
Key question: What is an ethically acceptable relationship between humanity and technology?

Enlightenment

In addressing the goal of *Enlightenment*, I look at how *Doctor Who* characterises truth, rationality and reason and how it engages with science's alternatives. A key recurring theme is representations of omniscience as the antithesis of situated knowledges.
Key question: What are the most appropriate roles for scientific reason and scientism to play in human society?

The 46 year span of the program not only provides a wealth of data to draw on, it also provides an excellent opportunity to look at changes in the representation of science over a number of decades within one television program that follows the same basic format. This fact immediately suggests a thesis structure that breaks the program into time units for analysis, a structure followed by other works on *Doctor Who* including those by Tulloch and Alvarado (1983) and Chapman (2006). However, this is not a history thesis and I will not be discussing the contemporaneous social and political trends accompanying changes in the program's representations of science, so a chronological structure would be somewhat meaningless. An alternative logical thesis structure would be a thematic one, with one chapter examining each of the four goals for the democratisation of science, but the considerable interplay between the four goals would make this somewhat artificial and would necessitate considerable cross-referencing.

I have therefore chosen a 'problem-oriented' structure based on theoretical questions arising from the science communication literature. Each of Chapters 5-7 speaks to one or more issues in the public awareness of science that fictional representations of science — and specifically, *Doctor Who* — can shed some light on. These are summarised below. Before addressing these compelling issues, I contextualise the discussions in Chapter 4 with a chronological introduction to the changing presence of science through the program's history. This links the thesis to existing chronologically structured *Doctor Who* scholarship. By giving a detailed descriptive review of the main

characters, themes and plot types I also free myself to focus on particular case studies in the analytical chapters.

Chapter 5, "Imperialist impositions and democratic demands: the 'hero scientist'", examines *Doctor Who*'s moral messages about the appropriate role for science in societal governance. I examine *Doctor Who*'s fit to Margery Hourihan's (1997) contention that the hero construct in children's literature functions to promote Western imperialism. I analyse the role of science in *Doctor Who* serials that depict colonialist scenarios and the program's negotiation of the concept of 'civilisation', finding that it is indeed hegemonic. I then search for alternative polities within the program, seeking societies that role model more liberatory relationships between democracy and science. I conclude with a discussion of links between the hero scientist construct and Hugh Ruppersberg's (1990) concept of 'the alien messiah', illustrating the inherent problems for the democratisation of science if fiction relies upon these devices. This chapter's data are serials that feature scenarios in which governance of science and society is explicitly contested within fictitious communities. Democratisation in this context entails empowerment of the disenfranchised fictional characters within material governance structures.

Chapter 6, "Insanity and uncertainty: the 'mad scientist'", challenges the trope of the 'mad scientist': the conjecture touted by Christopher Toumey (1992, 1996), Weingart (2006) and others that 'baddie' scientists have a negative impact on public perceptions of science because they are designed to critique science. I contend that many scientist villains in *Doctor Who* are not intended to embody a critique of science at all, and that non-scientific character traits can muddy the reception and interpretation of characters' meanings. The program actively references and subverts literary stereotypes that are generally considered to be antirationalist critiques, twisting them into pro-science celebrations. I also review the varieties of critique that scientist villains *do* embody in the program, and agree with the consensus in the literature that science-based fiction can function as an outlet for public debate about science. Democratisation in this context entails an ideological victory for real world public sentiment that contests the ethics or limitations of science: in a sense, protests offered by authors on behalf of 'the public' at a symbolic and 'universal' ideological level.

Chapter 7, "Reflexivity and role models: the 'fallible scientist'", discusses the uses and abuses of gender in the characterisation of *Doctor Who*'s scientists and the complexities of relationships between scientist and non-scientist companions. I critically analyse the scientist status of *Doctor Who*'s female scientist characters in the context of conflicting demands made of scientist characters. On the one hand, calls for reflexivity insist that scientists show fallibility and humanity, and drop the 'science' trappings that separate 'scientists' from 'the public'. Harry Collins and Trevor Pinch (1998), for example, advocate a fallible image for science — as neither deity nor demon but a human tool — in a policy context that has insisted scientists avoid showing uncertainty or fallibility to preserve science's expert status (J. D. Jensen, 2008). Accordingly, I observe a correlation in *Doctor Who* between fallibility in scientist characters and franchise in the sense of empowerment within science for non-scientist companions. On the other hand, it is only through donning the formal trappings of science that female scientist characters may gain credibility in representation. This may present a dilemma for fictional representation when striving for both equality and franchise, a point Joan Haran and colleagues (2008) touch on. Democratisation in this context entails empowerment of the disenfranchised at individual and local levels compared to scientist characters who are members of socially dominant groups (most prominently, men) including the Doctor himself.

Chapter 8, "Conclusions: audience empowerment through fiction" builds on the conclusions of Chapters 5-7 to identify the presence of contradictory models of science governance in *Doctor Who*, when viewed as a whole package. I contend that such contradictory messages are to a large extent unavoidable within the conventions of Western fiction in general and *Doctor Who* in particular, that this obscures authorially intended messages about science governance, and that it prejudices viewers towards accepting particular models of science governance before a work of fiction has even begun. I also return to questions of using *Doctor Who* as a science engagement tool in the classroom.

Before proceeding to the analysis, it is important to justify the methodological approach I use in the analytical chapters. Communication theorists (Hall, 1980; Suleiman, 1976) and sociologists of science (notably Locke, 1999, 2001, 2002, 2005) have long emphasised the primacy of social context for drawing meaning from communication. Any interpretation of a text's meaning, including a scholarly interpretation, is therefore

open to question. In testing this view, Jones (2001) found that contemporary critics' responses to representations of scientists in post-war British films did not necessarily match his reading of the films, suggesting audience reception can vary widely. Empirical studies of audience responses to the political orientation of *Doctor Who* have also found that viewers interpret the program's meanings and respond to it in diverse ways not expected by scholars and not consistent with scholarly interpretations (Butler, 2007a; McKee, 2004; Tulloch and Jenkins, 1995). These works present a strong challenge to assumptions about fiction's unitary influence on public attitudes to science. This thesis does not examine empirical audience response data, but rather seeks to establish a legitimate interpretation of the text for the purpose of analysis: a "preferred reading", to borrow Jones' term, that somehow reflects authorial intention. But since an interpretation of the meaning of a text is socially conditioned, how then is it possible to establish authorial intention?

A television program is the product of innumerable authors (writers, directors, producers, script editors, actors and so on), so it is usually not possible to attribute the intention behind a given element of a *Doctor Who* serial to a specific person. But nor is this necessary to establish authorial intention. I here use 'author' in the sense that Peel (2002) uses "implied author," meaning "not an actual person," and possibly not resembling the real author at all, but "the projection of a person," who carries beliefs that are "crucial [...] to analyze" to understand the intended meaning of a text (Peel, 2002, p. 19). Gregg (2004, p. 649) sees *Doctor Who* as "a 'cultural forum' that allows for issue raising and [...] commentary on ideological problems," as essentially a rhetorical act invested with didactic intention. The question then is how to circumscribe that intention for analysis.

Hall (1980) identifies the problems inherent in attempting to decode a text's meaning in a way that is consistent with how it was encoded in production: different contexts of encoding and decoding inevitably lead to misinterpretations. I deal with this problem in two ways. First, I rely upon key structural elements of *Doctor Who* including the ideological function of 'goodies' and 'baddies' in a conventional Western literary narrative, which Hourihan claims is so familiar in Western culture that audiences "have no difficulty in decoding it" (Hourihan, 1997, p. 46), consistent with Fiske (1984). Second, drawing on over 200 serials enables me to identify *recurring* themes, rather than interpreting specific serials' individual meanings in isolation, and hence to identify

categories of meaning in the program rather than mere instances. The analytical chapters include both extensive overviews that summarise major trends and more detailed case studies which illustrate how those trends play out.

In fiction that does not shy away from didacticism, dialogue is an effective means of encoding intention, particularly when the moral position of a character as 'good' or 'evil' is understood to be beyond doubt. Understanding the attitudes of the Doctor and companions is therefore key, since they symbolize the 'correct' and 'good' in the program's moral framework. The Doctor largely fits the classic Western literary construct of the hero (Hourihan, 1997, see also Chapter 5), and accordingly, almost without exception, *Doctor Who* tales straightforwardly depict adventures in which goodies are ultimately right and baddies are ultimately wrong. As a children's program, the moral message is often explicitly articulated, with the Doctor and companions engaging in speech-making about right and wrong, including right and wrong within science. Gauging authorial intention in such cases is then a relatively simple matter of reproducing these characters' statements and actions. Further, authorial intention may be gauged from the core dilemma of each serial, which pits the goal of the Doctor and his allies (the goodies) against those of the villains (the baddies). The resolution of this dilemma "invests the narrative as a whole with meaning" (Hourihan, 1997, p. 49) and effects the ideological closure of a story. Thus, a serial's intended meanings can be gleaned from an analysis of the narrative arc, as per Fiske (1984).

Each of these factors contributes to the rhetorical frame of a serial: the terms in which the serial's meaning is set up and how it is delivered. Hall (1980) notes that the possibility of multiple meanings does not imply pluralism; rather, possible decoding strategies are ordered hierarchically according to dominant cultural discourses. Irrespective of discourses dominant in Western culture — some of which I bring into the analyses — *Doctor Who*'s structural elements and recurring themes constitute *their own* dominant discourse within the confines of the program's production so are effective tools to use in analysis.

In this chapter I have reviewed the ways in which science fiction acts as a medium of science communication, and therefore has the power to influence the democratisation of science. I have introduced the basics of the case study, *Doctor Who*, and shown via the scholarship of others that it presents substantial material that feeds into questions of

science and ideology. Finally, I have outlined my proposed methods for assessing *Doctor Who*'s contribution to the democratisation of science.

Let us then proceed to the analysis.

CHAPTER 4 A CHRONOLOGICAL PORTRAIT OF THE PRESENCE OF SCIENCE IN *DOCTOR WHO*

In Chapters 1-3 I established that *Doctor Who* has a reputation for being a science oriented program, has enough science content to provide material for at least two books, and engages with science-related philosophical and political themes. I now offer a review of the presence of science in the program as it has changed over the decades, including an introduction to the science-orientation of the nine incarnations of the Doctor and of his companions, and the extent to which science-related plots, themes and characters appear in the program. I preview broad trends related to key themes *enlightenment* and *progress*, describing the program's interest in issues of scientism and technologisation prior to analysing this in more depth in later chapters.

As the central character of the series, the characterisation of the Doctor as scientist is critical to understanding the show's intended representation of science. The early Doctors were fond of calling themselves scientists, but as the show went on, other traits competed with scientific expertise for dominance of the character. Neither of the new series Doctors have ever called themselves scientists, marking a significant change. In the new series, the epithet 'Doctor' has been linked with 'healing' and 'making things better', but throughout the classic series it was primarily a signifier of scientific authority: for example, companion Ace referred to the Doctor as 'Professor'. Over the four decades of *Doctor Who*'s production, the Doctor's traits changed considerably in terms of general personality, relationship with companions, and relationship and attitude to science, all of which have the potential to have an impact on public perceptions of science and scientists.

Companions' relationships to science are equally critical for interpreting 'preferred readings' of *Doctor Who* stories, since companions are (at least in theory) the loci of viewer identification. The level of scientific training of companions as well as their attitudes to science can vary considerably from one to the next. Non-scientist companions' relationships to the Doctor provide useful data for evaluating the program's representation of scientist-public relationships, while the representation of more scientifically oriented companions reflects on the program's engagement with key theme *equality* (discussed in Chapter 7). Some understanding of who the companions

are and which Doctor(s) they travelled with will be useful pre-reading for understanding later chapters.

Doctor Who is not solely a show about science, but has always been an adventure in time and space, with journeys into Earth's history, alien worlds, parallel universes, and various incarnations of humanity's future. As noted by Davies (1990), the science in science fiction can sometimes just be a part of the background setting necessary to mark the genre. As *Doctor Who* has grown over the decades, it has become generally more message-oriented than it was at the beginning, offering ideological closure around matters of morality, ethics and correct behaviour. Sometimes such messages involve aspects of science or technology but often they do not. A number of stories offer no ideological closure at all in their resolutions, rather presenting the Doctor and his companions with a danger and resolving the problem with their escape to safety. I label these 'adventure' stories. I label the message-oriented stories 'didactic' stories. These labels help identify the overt rhetoric of the program that is presented via ideological closure. Adventure stories, along with more subtle elements of didactic stories, also make ideological statements, but these will be teased out and discussed where relevant in later chapters. Given that science themes do not have a major role to play in every serial, one of the purposes of this chapter is to identify those stories which do deal deeply with science-related themes. I mark trends in science issues and topics addressed by the program. I also list prominent non-continuing scientist characters, where the category 'scientist' is broadly defined to include science researchers, physicians, engineers and technicians, and the category 'prominent' signifies characters whose interventions have a critical impact on the plot, and who have their own dramatic arc. Pairs or groups of characters who serve the same dramatic function in a serial count as one character. For example, the members of the base crew in *The Impossible Planet* (2006) serve the same narrative function because they contribute jointly to the negative impact that their science has on the universe, so they count as one character. On the other hand, the two scientists Keeler and Chase in *The Seeds of Doom* (1976) come into conflict over scientific issues, and so serve different narrative functions, so they count as separate characters (see Chapter 6 for a longer discussion of these characters).

Chapter structure

This chapter is structured chronologically to tether the analysis in Chapters 5-7 to the historical context of the program.

Most texts on *Doctor Who* divide their discussion into segments corresponding to Doctor eras, and here I do the same to some extent, particularly when discussing the Doctors themselves. However, following a strict division by Doctor era risks placing too much emphasis on the character of the Doctor over other factors such as companions, production teams, external social and intellectual trends and so on, all of which can influence the program's representation of science. Therefore broadbrushing about general trends in the program is more useful than description at a finer scale. For these reasons, I break the chapter into four sections corresponding to calendar decades, to enable a convenient comparison across time, while also trying to accommodate 'natural' breaks in the program's production. Conveniently, each decade includes an approximately equal number of serials. This division by decades is more or less in agreement with the ideologically distinct time units identified by Moore and Stevens (2007).

In the section on the 1960s, I look at the period 1963-69, seasons 1-6 (50 serials). This corresponds to the William Hartnell and Patrick Troughton eras, and also marks a neat break in companion characters and producer. Sixties *Doctor Who* was structurally different from later *Doctor Who* in that the program was filmed in black and white and was broadcast weekly for the best part of a year, with an average of 42 episodes per season. I argue that the transition from the '60s to the '70s corresponds to a change in the program's ideological commitment to science, from somewhat ambivalent in the '60s to earnest and scientistic in the '70s. Producer-script editor production teams in the '60s changed more often than in later decades, including short-lived transitional appointments scattered among the four main teams of Verity Lambert and David Whitaker; Lambert and Dennis Spooner; Innes Lloyd and Gerry Davis; and the threesome of Peter Bryant, Derrick Sherwin and Terrance Dicks (see Appendix A). This 'professionalist' approach to production (as opposed to an '*auteur*' approach linked to longer term involvement of individuals) perhaps explains why '60s *Doctor Who* had less obvious overarching direction or intent than later eras.

In the section on the 1970s, I look at the period 1970-79, seasons 7-17 (58 broadcast serials), corresponding to the Jon Pertwee era and most of the Tom Baker era. Lumping the tenures of the two longest serving Doctors into one section seems slightly disrespectful and also potentially unwieldy, but the 1970s stories are considerably thematically unified. Pertwee's first season in 1970 marked the beginning of colour filming and a cut down broadcast schedule of just 25-26 episodes per year, which continued to the end of the decade. It introduced new companions, including a closer working relationship for the Doctor with the Earth-based UNIT. The Tom Baker era was aesthetically distinct from the Pertwee era, but it retained similarities in terms of its ideological attitude to science, particularly with its underlying ethos of scientism. The Pertwee era (seasons 7-11) had a fairly consistent production team, with the same producer (Barry Letts) and script editor (Dicks) throughout: these two production roles being key to creating the ideological and dramatic direction of the program (Hulke and Dicks, 1972). Seasons 12-17 had two producers (Philip Hinchcliffe, Graham Williams) and three script editors (Robert Holmes, Anthony Read, Douglas Adams) unique to the Tom Baker era, who took the show to the end of the 1970s.

The section on the 1980s describes 1980-89, seasons 18-26 (50 serials). Season 18 was Tom Baker's last, but it was new producer John Nathan-Turner's first, and thematically it had more in common with the rest of the 1980s than with Baker's first six seasons. Nathan-Turner remained producer until the end of the original series, so although the 1980s featured four Doctors — Tom Baker, Peter Davison, Colin Baker and Sylvester McCoy — this decade of *Doctor Who* had a sameness about its aesthetic and science ideology. Nathan-Turner introduced new production values to the program in season 18 such as a new title sequence and new incidental music composers, sacking the prolific Dudley Simpson (Richards, 2005) whose music for 60 of the 100 completed serials in seasons 2-17 had lent the series a unified distinctiveness. The unparalleled success of Tom Baker as the Doctor prompted Nathan-Turner to effect major changes to the Doctor's characterisation for Peter Davison in season 19, "to avoid accusations of offering up pale imitations of [*Doctor Who*'s] glory days" (Richards, 2005, p. 287). Such changes went hand in hand with a new broadcast schedule in the UK, breaking from the traditional Saturday tea-time timeslot, and airing instead twice weekly on weeknights at 7pm (Richards, 2005). Stories were also shorter (2-4 episodes) on average, with only one 6-part story (actually 3 double-length episodes) produced in the whole Nathan-Turner era. In addition to these production shifts in *Doctor Who*, the

1980s was a decade of consolidation for post-structuralist sociological challenges to science. Werskey (2007) notes that in the 1980s critiques of science moved away from the overtly political, modernist, Marxist trends that had dominated critiques during the '60s and '70s — trends which (in the tradition of Marx) privileged science over other ways of knowing (Locke, 2001) — towards postmodernist pluralism. Werskey also notes changes from 1981 onwards in the political role of science in the West, with developments in microelectronics and communications technology (among others) strengthening capitalism's social control, for example through surveillance. All of these influences are apparent in '80s *Doctor Who*. Three script editors worked on the program in the 1980s (Christopher H Bidmead, Eric Saward, Andrew Cartmel) with a fourth (Antony Root) credited but only peripherally involved (BBC, 2009a).

In the final section of the chapter I turn to the new series 2005-08 (43 serials), which featured not only new Doctors and new companions but new production teams united under head writer and executive producer Russell T Davies. Davies is widely considered to be the single most influential person in the production of the new *Doctor Who* (Charles, 2008), so the producer-script editor team considered to be key in the original series as noted above was less important in the new series. Davies finished his involvement with the program at the end of 2009, but because of time constraints the material for this thesis finishes with the final story of 2008. The new series format in Series 1-4 was very different from the classic series, with thirteen 45 minute episodes per year plus a Christmas special, and a new century brought innovations in the production values of the show. It also brought innovations in real world science and technology, and changing understandings of the social place of science, including the rise of PAS, so the new series' level of engagement with PAS concerns is particularly interesting to investigate.

A note on my punctuation conventions: in the analysis that follows in this and subsequent chapters, when discussing the discursive commitments of *Doctor Who* I use double quotation marks (“ ”) to identify words and phrases drawn directly from the program's rhetorical repertoire, i.e. usually from dialogue. I use single scare quotes (‘ ’) to identify ideas which I believe are discursively present in the program, but which are not present literally in the dialogue of the particular serials being discussed.

The 1960s: Contested Possibilities

The Doctors of the 1960s

The idea of the Doctor as first and foremost a scientist was clearest in the Hartnell era, during the time of producer Lambert's direct involvement with the program. The First Doctor's primary passion was to explore space and time; he was a scientist-adventurer as Haynes (1994) notes, berating his companions, "This is a scientific expedition, not a joy ride!" His goal was to pursue "scientific researches", specifically *to observe* and not to intervene. He laid claim to a 'logical' or 'scientific' approach to all problems, praising companions when they too employed logic and occasionally belittling them for being irrational. He believed his intellect to be superior to most (all?) others, routinely claiming it to be so and deriding the intellect of people he met, such as when he called Marco Polo, "you poor, pathetic, stupid savage". On occasion this belief was shown to be false, allowing other characters (and viewers) opportunities to laugh at his puffing egotism. At times his quick-wittedness at getting himself out of trouble led to disaster, as when he inadvertently inspired Emperor Nero to set fire to Rome.

Tulloch and Alvarado (1983, p. 18) contend that Lambert's original conception of the Doctor was as an embodiment of mystery, that central to his character was a "sense of defining the unknown by means of the contradictory": "imperious old age and childlike vulnerability, colossal scientific wisdom and irresponsible irrationality". This sense of mystery and contradiction made the Doctor a compelling character from the outset, but in this conception there is no sense of the freedom fighter or righter of wrongs that would become increasingly central to the character from the late '60s onward, and which has become dominant in the 21st century.

The name 'Doctor' served as a mask for the character's mysteriousness, literally "Doctor who?" as companion Ian asked in frustration in the first episode. Hartnell's Doctor was a strange man, a ticket to adventure, and a trouble-maker. In his first story he kidnapped companions Barbara and Ian in the TARDIS, wickedly laughing, and was then unable to get them home. He at first had dubious morals, threatening to bang an inconvenient prehistoric warrior on the head with a rock in *An Unearthly Child* (1963), simply out of desperation to escape danger.

This dark flavour mellowed halfway through the first season. The Doctor then joined his companions in their conscientious bid to do right by the people they met, although it was not until season 3's last stories *The Savages* (1966) and *The War Machines* (1966) that the Doctor acted voluntarily to oppose evil, rather than opposing it out of self-preserving necessity.

This transformation was continued in the Troughton era, at which time the Doctor became a fully fledged campaigner against evil, opposing it at every turn rather than running away at the first opportunity. A speech in Troughton's fourth story, *The Moonbase* (1967), emphasised this shift in his priorities: "There are some corners of the universe which have bred the most terrible things. Things which act against everything that we believe in. They must be fought."

Troughton's Doctor continued to claim to be a scientist, and scientific and technical skills remained his primary means of defeating his enemies, but he no longer claimed to be conducting 'scientific researches'. In another contrast to Hartnell's Doctor, he did not prize logic. Indeed, he openly chided logic on occasion, proclaiming in *The Wheel in Space* (1968), "Logic, my dear Zoe, merely enables one to be wrong with authority." Whereas the Hartnell era frequently pitted the Doctor's cold logic and objectivity against others' intuition and subjective involvement, the Troughton era pitted a dialectic of the two embodied within the Doctor against brutality, lies and exploitation. The Doctor remained a mystery defined by contradictions, but in Troughton's case those contradictions were technological brilliance combined with romantic humanism, an irreverent disregard for authority alongside opinionated righteousness. This characterisation was to set the tone for the future of the series.

The Troughton era retained a strong sense of mystery that the later series lacked. Where the Doctor acquired his scientific skills and knowledge remained completely unknown until the penultimate Troughton episode, when he contacted his own people to help him right a terrible wrong, and viewers discovered he was a Time Lord. Until then, all we knew was that he was an alien who could not return home. We knew he was very clever since he, his companions and his enemies frequently remarked upon it. But his actual qualifications remained as mysterious as the man himself. In *The Aztecs* (1964) Hartnell's Doctor claimed his scientific skill was in engineering, but otherwise he hand-wavingly referred to himself as 'a scientist', 'a man of science' or 'a doctor of science'.

Troughton's Doctor was just as vague. He usually denied that he was a doctor of medicine and refused to treat the sick (bar first aid), although in *The Moonbase* he claimed to have taken out a medical degree under Joseph Lister in 1888. In *The Enemy of the World* (1967-8) the Doctor refused to state his field of expertise to the stranger Astrid who saved his life:

Astrid: Oh, you're a doctor?
Doctor: Well not of any medical significance.
Astrid: Doctor of law? Philosophy?
Doctor: Which law? Whose philosophies, eh?
Astrid: I see, you're determined to be mysterious.
Doctor: Am I?
Astrid: Um, doctor of science? [...] A doctor of divinity then?
Doctor: You'll run out of doctors in a minute.[15]

Companion Jamie similarly had problems identifying the Doctor's field to new companion Zoe in *The Wheel in Space*:

Zoe: This Doctor friend of yours. Is he a scientist?
Jamie: He is in a way I suppose, yes.
Zoe: What's his speciality?
Jamie: His what?
Zoe: Well, is he a physicist, biochemist, astronomer, biometrician?
Jamie: Yes, he is.

This vagueness gave the Doctor not only awe-inspiring mystique but left room for him to solve almost any scientific problem with which he was presented. On occasion, he used the rhetorical power of science to win minor victories over hostiles: in *Galaxy 4* (1965), he boasted he could prove a hypothesis true because he is a scientist, and he went on to do so. The Doctor's scientific know-how contributed significantly to the

[15] For this and for all other quotes from 'lost' stories (with one or more episodes missing), I am indebted to the Earthbound Timelords *et al.* (2007). The quotes I reproduce are adapted from their transcripts. For existing episodes of lost stories transcripts were checked against video or DVD resources. The stories with lost episodes are identified in Appendix A. All quotes from non-lost stories were transcribed by me directly from recorded television broadcasts or DVD releases.

resolution of 21 out of 50 1960s serials as well as to minor plot points.[16] For example, in season 1, the Doctor saved the travellers from dying of thirst in the desert by collecting condensation formed inside the TARDIS after a cold night (*Marco Polo* (1964)), he 'reinvented' the wheel to craft a pulley (*The Aztecs*), and he used experimental techniques to determine the cause of a mystery illness (*The Sensorites* (1964)). The language of computers came into play in *The War Machines*, in which the Doctor trapped a hostile robot with an electromagnetic loop, and then reprogrammed it. More fantastically, in *The Ice Warriors* (1967) he disposed of the eponymous warriors with 'unsympathetic sonic vibrations', did a similar thing involving 'sonic laser' technology to a seaweed monster in *Fury from the Deep* (1968), and manipulated Earth's weather to make conditions hostile to invading fungus in *The Seeds of Death* (1969). While science was not the Doctor's only area of expertise, it was certainly one of the most important.

It is important to note, however, that attempts were made to explain most of the principles behind this science in contemporary Earth terms, even if it involved speculative technology.[17] The science became more high level as the decade went on, ranging from transparently explained high school science to 'advanced jiggery pokery', by which I mean technical skill that relied on viewer trust in the Doctor's expertise for its credibility. Unlike in later eras, here 'advanced jiggery pokery' mostly involved relatively straightforward technical tasks such as defusing bombs and sabotaging industrial-style piping systems: specialist areas to be sure, but not magical. *Deus ex machinas* and mystical 'Time Lord magic' — effectively supernatural skills masquerading as 'advanced science' — were not used to effect plot resolutions in '60s *Doctor Who*, whereas in the '80s and 2000s this became routine. Some '60s technological mechanisms were obscure (e.g. *The Keys of Marinus* (1964), *The Web Planet* (1965), *The War Games* (1969)), but those technologies belonged to other peoples as intrinsic components of the speculative premise of stories, rather than as *deus ex machinas* whose efficacy was justified by the Doctor's alienness or exceptional

[16] The Doctor used transparently-explained (if dubious) 'high school' science to effect resolutions in *The Aztecs*, *The Sensorites*, *Planet of Giants*, *The Ice Warriors* and *The Krotons*. He used more specialised science for which some transparent explanation was given in *The War Machines, The Power of the Daleks*, *The Moonbase*, *Fury from the Deep* and *The Seeds of Death*. Advanced jiggery pokery (see text) resolved plots in *The Keys of Marinus*, *The Dalek Invasion of Earth*, *Galaxy 4*, *The Macra Terror*, *The Faceless Ones*, *The Evil of the Daleks*, *The Tomb of the Cybermen*, *The Web of Fear*, *The Wheel in Space*, *The Space Pirates* and *The War Games*.

[17] Only once in the '60s did the Doctor refuse to give an explanation for solving a technical problem, when he used the 'special properties' of alien sunlight to break a lock, but refused to tell Steven what the properties were. This was one of many minor hurdles in the story, not the major problem (in *The Daleks' Master Plan* (1965-6)).

intelligence. Even the sonic screwdriver, used to solve all manner of problems in the new series, was mostly used to undo screws in the '60s.

Aside from science, five '60s plots were resolved through the 'power of irrationality' as embodied in reified emotion (such as a literal 'emotion ray'), compassion, intuition or humanist self-sacrifice, seven through inevitabilities intrinsic to the problem, seven through violence, two through lawful justice and eight by the TARDIS crew's escape to safety. Companion-incited revolution of an oppressed people resolved *The Space Museum* (1965) (Figure 3).[18]

The final introductory point to make about the '60s Doctors concerns their dramatic role in the program. Fiske (1984) argues that the Doctor's role is 'donor' not 'hero' in his analysis of the Fourth Doctor story *The Creature from the Pit*. As donor, the Doctor does not undergo a transformation during the story but rather contributes knowledge, skills and gifts that allow other characters to transform, making *them* the heroes (Vogler, 2007). However, the same argument cannot be made for 1960s *Doctor Who*. Hartnell's Doctor in particular continually undergoes transformation through his adventures, learning and changing, just as his companions and other characters do. The First Doctor, then, is not a donor, he is a hero. Troughton's Doctor is too, though to a less obvious extent. He makes minor errors, he fails, he learns, and he is ultimately punished in *The War Games*. This is an important point to note in analysing the Doctor as role model for the democratisation of science, as will become clear in Chapter 5.

Companions of the 1960s

The Doctor's companions of the 1960s were all humans from different time periods, with the exception of the Doctor's granddaughter and fellow alien, initial companion Susan (Carole Ann Ford). Their humanness provided familiar grounding for the

[18] Reified emotion, compassion, intuition, sacrifice: *The Edge of Destruction*, *The Romans*, *The Savages*, *The Evil of the Daleks*, *The Tomb of the Cybermen*. Intrinsic inevitabilities: *The Daleks' Master Plan*, *The Ark*, *The Celestial Toymaker*, *The Gunfighters*, *The Tenth Planet*, *The Abominable Snowmen*, *The Dominators*. Violence: *The Daleks*, *The Web Planet*, *The Smugglers*, *The Highlanders*, *The Underwater Menace*, *The Mind Robber*, *The Invasion*. Lawful justice: *The Enemy of the World*, *The War Games*. Escape to safety: *An Unearthly Child*, *Marco Polo*, *The Reign of Terror*, *The Rescue*, *The Crusade*, *The Chase*, *The Myth Makers*, *The Massacre*. *Mission to the Unknown* was not resolved, being a teaser for *The Daleks' Master Plan*. Some stories involved multiple factors in their resolution, for example the reified emotion that effected the resolution in *The Evil of the Daleks* was made possible through the Doctor's scientific expertise. This is different (for example) from the Pertwee era story *The Daemons*, in which the reified emotion was the product of a character's self sacrifice, not a product of science.

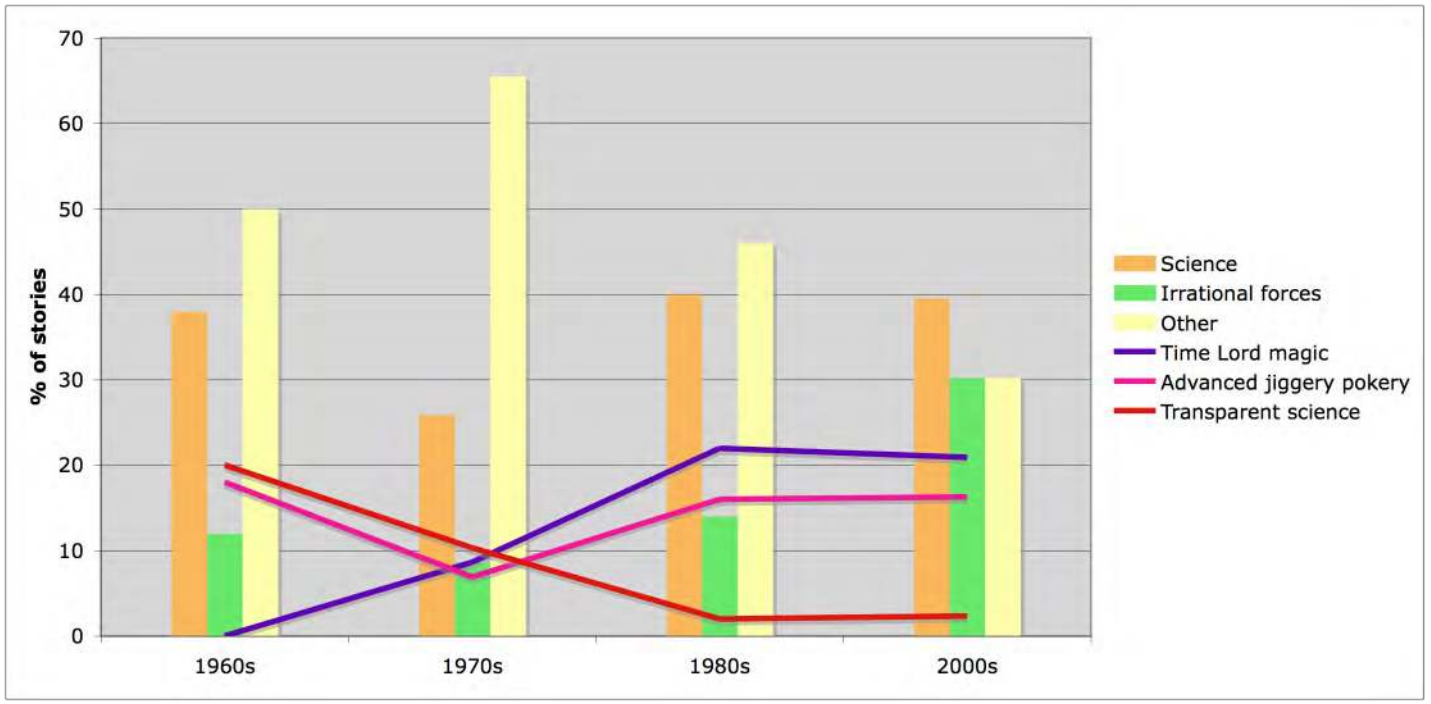

Figure 3. Relative frequencies of devices used to resolve plots in each decade. Histograms compare the relative frequency of science-based devices compared to irrational forces and other methods of resolution. Use of irrational force devices increased in the new series, but employment of science-based devices remained relatively constant over time, mainly supplanted by other devices (primarily violence and persuasive reason) during the dip in the 1970s. Linear plots compare the use of the three varieties of science-based devices. An increase in Time Lord magic solutions correlates with a decrease in the use of transparent science over the first three decades, stabilising in the new series, while the use of advanced jiggery pokery remained more or less constant.

Definitions

All science: 'Time Lord magic' plus 'Advanced jiggery pokery' plus 'Transparent science'.

Time Lord magic: demystified and rationalised *deus ex machina*-type forces that 'magically' or paranormally effect a resolution through phenomena centred around the alien physiology of the Doctor or other characters or the mysterious nature of the TARDIS and time travel.

Advanced jiggery pokery: opaquely explained science often involving alien technology including most sonic screwdriver work.

Transparent science: science that is either transparently explained and/or conceivably straightforward for a contemporary Earth scientist.

Irrational forces: those forces that are explicitly not demystified or rationally explained away, including reified emotion, humanist self-sacrifice, psychic mysticism, intuition, compassion and the symbolic freeing of the oppressed.

Other: violence, persuasive reason, lawful justice, intrinsic factors of the problem, unresolved problems and plots resolved through running to safety.

delivery of particular ideological-philosophical perspectives on science and technology, clearly intended to represent different versions of 'us'.

The 1960s was the only period in the series' history to include companions from Earth's past, including the short-lived Katarina (Adrienne Hill) from Ancient Troy, Jamie McCrimmon (Frazer Hines), a Jacobite Highlander from 1746, who had the longest tenure of any companion[19], and Victoria Waterfield (Deborah Watling) from 1866 Victorian England. These characters, particularly Jamie, provided contrast with the future-orientation of the program, allowing exploration of 'how far we've come' thanks to science. In *The Highlanders* (1966-7), for example, the Doctor uses astrological "codswallop" to convince Jamie not to use leeches on a sick man, since Jamie has "never heard of germs" so won't understand more conventional scientific reasoning against bloodletting. Jamie here represents an ignorant past improved with progress. In other scenes these companions from the past provided 'naïve' but resonant romantic humanist commentary on the dangers of where technology might be taking us.

The '60s was also the only decade until the new series to feature human companions overtly from the future.[20] Vicki (Maureen O'Brien), Steven Taylor (Peter Purves) and pseudo-companion Sara Kingdom (Jean Marsh) were all picked up by the First Doctor from unspecified centuries in humanity's future. Zoe Heriot (Wendy Padbury), a space-station dweller from the 21st century, was the last companion to join the 1960s TARDIS. These characters perhaps provided role models for young viewers who enjoyed envisioning themselves in a technologically cornucopian, space-age future. All four of them exhibited scientific knowledge that 20th century viewers would call expert, although to them it was basic, contributing to a cornucopian idealist ethos.

The remaining companions were all from 1960s Earth. Barbara Wright (Jacqueline Hill) and Ian Chesterton (William Russell) were well-mannered 1963 high school teachers in history and science respectively who wandered into the TARDIS in the first episode. Dodo Chaplet (Jackie Lane) was a Londoner from the mid-sixties who spoke in slang

[19] Jamie featured in 20 serials (113 episodes) (excluding return appearances in the 1980s and including a small number of episodes where Frazer Hines was on leave). K-9 was in more serials (22, 94 episodes), but K-9 frequently made only token appearances and never had the screen presence of humanoid companions. Rose was also in more serials than Jamie (23) but these comprised substantially fewer episodes (30) and were mostly contained within 2 seasons as opposed to Jamie's nearly 3 seasons as companion.

[20] Leela is a possible exception, though it is hard to know how to classify her. While technically a human from a future Earth colony, she was devised as a 'savage', unfamiliar with technology, so represented a 'primitive' past (see Chapter 7). She also resembled an alien companion, being unfamiliar with the Earth altogether.

words like ‘fab’ and ‘okay’. Polly (Anneke Wills), a secretary who liked clothes from Carnaby Street, and Ben Jackson (Michael Craze), a Cockney sailor, were both from ‘swinging London’ of 1966.[21] These characters represented contemporary values, allowing contrast with alternative social possibilities as well as (presumably) functioning to draw contemporary audiences into the fantasy world of the program.

Zoe was the only true scientist companion in this era, having qualified as an astrophysicist specialising in pure mathematics (with honours). Others possessed considerable scientific competence though, including future-dwellers Vicki, Steven and Sara. Similarly, Susan, as a member of the Doctor’s race, dazzled Ian and Barbara with her scientific knowledge. Science teacher Ian declared Susan knew more science than he ever would, but he proved his own scientific mettle in numerous adventures. Barbara, while not a scientist, had extensive expert knowledge of history, and was characterised as intellectual counterpart to Ian in this sense. Victoria’s father was a scientist, and she picked up a few things from him. Katarina, Jamie, Dodo, Polly and Ben were represented as the companions who were decidely not scientifically literate (Table 1), and at times this prompted conflicts over elitist and scientistic notions of expertise, in the spirit of 1960s contestation in *Doctor Who* (discussed in Chapter 7).

Science plots, themes and characters of the 1960s

Serials broadcast during the first three and a half seasons (1963-66) of *Doctor Who*, and particularly 1963-65, while sometimes containing science and technology elements, were largely adventure stories set in the past or the future without science-related didactic messages (Table 2). The didactic stories from this period were for the most part concerned with questions of personal sacrifice in desperate times or with the argument that pacifism is futile: likely references to the Second World War as others have noted (e.g. Charles, 2007).[22]

[21] These characters themselves reflected changing class politics within the BBC, since Dodo’s character, devised as a Cockney in 1965, was not permitted by the BBC management to speak in a Cockney accent, but Ben was, less than a year later, because the BBC policy changed (BBC, 2009a).

[22] Futuristic adventures from this period: *The Rescue, The Chase*, *The Celestial Toymaker*. Historical adventures: *Marco Polo*, *The Reign of Terror*, *The Romans*, *The Crusade*, *The Myth Makers*, *The Massacre*, *The Gunfighters*, *The Smugglers*, *The Highlanders*. Great sacrifice stories: *The Dalek Invasion of Earth*, *Mission to the Unknown*, *The Daleks’ Master Plan*. Pacifism-themed stories: *The Daleks*, *The Web Planet*, *The Space Museum*.

Table 1. Science orientation of companions, by decade.

Science orientation	1960s	1970s	1980s	2000s
Scientist (formally qualified in science at least partly, specialisation listed)	Ian (science teaching) Zoe (mathematics)	Liz (physics, medicine) Harry (medicine) Romana (Time Lord Academy studies)	Adric (mathematics) Nyssa (bioelectronics) Peri (botany) Mel (programming)	Adam (IT) Martha (medicine)
Techno-savvy because of alien or future origin	Susan (Time Lord) Vicki (future) Steven (future) Sara (future)	K-9 (robot computer)	Turlough (alien) Kamelion (robot)	Jack (future)
Informally educated techno-skilled		Leela (anatomy)	Ace (explosives)	Mickey (hacking)
Slightly science literate for some other reason	Barbara (teacher) Victoria (scientist father)	Sarah (journalist)		
Largely science illiterate (all from Earth present or past)	Katarina Dodo Polly Ben Jamie	Brigadier Benton Yates Jo	Tegan	Rose Jackie Donna

Table 2. 1960s serials containing prominent science-themed didactic messages (black or coloured background). 'Democratisation of science for democracy' stories are red. The 'antirationalist' story is green. 'Collaborator' stories are purple; 'boffins against the invaders' stories are blue (*The Invasion* fits both categories). Serials with a white background are primarily adventure stories which may or may not contain science and technology elements and characters.

Doctor	Year	Serial title	Scientist characters
1 William Hartnell	63	An Unearthly Child	
	63-4	The Daleks	Dalek scientists
	64	The Edge of Destruction	
		Marco Polo	
		The Keys of Marinus	**Arbitan**
		The Aztecs	
		The Sensorites	**Sensorite scientists**
		The Reign of Terror	
		Planet of Giants	**Smithers, Farrow**
		The Dalek Invasion of Earth	Dortmun
	65	The Rescue	
		The Romans	Locusta
		The Web Planet	
		The Crusade	
		The Space Museum	**Moroks**
		The Chase	
		The Time Meddler	**Meddling Monk**
		Galaxy 4	**Drahvins, Rills**
		Mission to the Unknown	
		The Myth Makers	
	65-6	The Daleks' Master Plan	
	66	The Massacre	Preslin
		The Ark	
		The Celestial Toymaker	
		The Gunfighters	
		The Savages	**Senta**
		The War Machines	Brett, Krimpton
		The Smugglers	
		The Tenth Planet	Cybermen, Barclay, base crew
2 Patrick Troughton		The Power of the Daleks	Lesterson, Janley, Valmar
	66-7	The Highlanders	
	67	The Underwater Menace	Zaroff, Damon
		The Moonbase	Moonbase crew
		The Macra Terror	Macra
		The Faceless Ones	
		The Evil of the Daleks	Maxtible, Waterfield
		The Tomb of the Cybermen	Kaftan, Klieg, Parry, Viner
		The Abominable Snowmen	Professor Travers
		The Ice Warriors	Penley, Garrett, Clent, Arden
	67-8	The Enemy of the World	Salamander
	68	The Web of Fear	Professor Travers, Anne Travers
		Fury from the Deep	**Harris, Jones**
		The Wheel in Space	Corwyn, Wheel crew
		The Dominators	**Balan, Kando, Teel, Dominators**
		The Mind Robber	
		The Invasion	Vaughn, Gregory, Watkins, UNIT
	68-9	The Krotons	Krotons, Beta
	69	The Seeds of Death	Eldred, Kelly
		The Space Pirates	
		The War Games	Alien Scientist

Only a few stories from this time contained significant moral lessons related to science. The first story, *An Unearthly Child*, posited that the democratisation of scientific knowledge is necessary for democracy. *The Edge of Destruction* (1964) closed with an antirationalist solution that trumped logic. Three stories warned of the dangers of altering 'natural' trajectories of technological development (*The Aztecs*, *The Time Meddler* (1965), *The Ark* (1966)). Three depicted protests against unwanted scientific projects (*The Sensorites*, *Planet of Giants* (1964), *The Savages*). Three presented humanist objections to technologised lifestyles (*The Keys of Marinus*, *Galaxy 4*, *The Tenth Planet* (1966)). One of the 'pacifism is futile' stories engaged obliquely with the role of imperialist science in the lives of a colonised people (*The Space Museum*) (Table 2).

This 'early '60s' period did present challenges to science, but its overall tone was tentative, equivocal, questioning and explorative regarding the role of science in human lives, rather than making bold statements embracing or rejecting science. There were some scientist characters from this time (Table 2), but these were few and far between, in many cases were minor roles (Dalek scientists, Artamon, Locusta, Preslin), and in some cases (Meddling Monk) were important to the plot for being powerful, their scientific prowess merely incidental. No unified philosophical position on science may be gleaned from this period because the perspectives explored were generally too non-committal.

The tentative approach began to change in 1966, when the BBC freed up *Doctor Who* producers, allowing them to break with the original conception of the show (BBC, 2009a). Part of this freedom was permission to stop making the 'pure historical' stories that had been part of the program's original brief, thus eliminating the requirement for some stories to be purely 'exploring' and 'running away'. After Troughton's second story *The Highlanders*, all stories set in the past with the exception of 1982's *Black Orchid* were 'pseudo historicals' incorporating major speculative elements. This freed the Doctor from the practical constraints that prevented him from changing things, implicit in the pure historicals, and pushed him along the stereotype continuum from observer-adventurer to 'noble scientist', emphasising ethical idealism, principled protest or altruistic leadership in science (Haynes, 2003). Thus, it was in the late Hartnell era, beginning with *The Savages* and its cruel, inhuman scientist Senta, that discussions of science, including science ethics, really gained prominence in *Doctor Who*.

Two stories from that year signalled important narrative themes that would come to dominate much of the Troughton era. One was *The Power of the Daleks* (1966), Troughton's first story, which was the first of four '60s stories to feature scientists collaborating with 'inhuman' Dalek or Cybermen forces to achieve goals of personal power (the others being *The Evil of the Daleks* (1967), *The Tomb of the Cybermen* (1967) and *The Invasion* (1968) (Table 2)). Three of the four were resolved through romantic humanist means, showing the triumph of the human spirit over ultra-rational, technologised enemies. This involved either literally using reified, distilled human emotion as a weapon, or noble self-sacrifice. *The Power of the Daleks* itself was resolved by the Doctor's science know-how.

The other trend-setting 1966 story was the season 3 finale *The War Machines*, which was the first to be conceived by unofficial scientific advisor Kit Pedler. It was one of eight '60s stories (five developed by Pedler, see Appendix B) to feature a 'boffins against the invaders' plot, in which the Earth was threatened by a technologically superior invasion force and Earth scientists (plus the TARDIS crew) were required to fight it off with humble Earth technology (Table 2). An important element of most of these stories was a question about being ruled by technology: those who were overly governed by it were destined to lose the battle, while those who retained their humanity won. Although a technologically competent scientist, the Second Doctor made it clear on several occasions that he hated computers and preferred not to use them. Again this was a victory for romantic humanism, but as in the 'collaborator' stories, this did not entail a rejection of technological progress *per se*. These stories rejected progress that went *so far* as to pose a threat to Enlightenment individualism. In six of these eight stories, the enemy being fought was literally bodily technologised: the logically insane computer WOTAN and its servo robots in *The War Machines*; cyberised humanoids the Cybermen in *The Tenth Planet*, *The Moonbase*, *The Wheel in Space* and *The Invasion*; and the robot Yeti in *The Web of Fear* (1968). In the other two stories, *The Ice Warriors* and *The Seeds of Death*, there were key conflicts among human scientists about the wisdom of relying upon new-fangled technology and computers to solve their problems.

To some extent, the 'boffins against the invaders' stories were propaganda pieces for science and technology. The future Earth under threat of invasion in *The Tenth Planet*, *The Moonbase*, *The Ice Warriors*, *The Wheel in Space* and *The Seeds of Death* was in each case represented as somewhat cornucopian. Variously, Earth's weather, food

distribution, global travel, space travel or communication were controlled technologically by collaborative international scientific bases. This adds weight to an ideological perspective which places hope and faith in science to address questions of human need. It showed how vulnerable such scientific bases render the Earth, should hostile forces take control of them, but ultimately human science and technology — and in particular the pioneering spirit of 'old-school' creative scientists — triumphed over the dangers (see Chapter 5). Scientist and technician characters did not question the 'good' of technological development, even though they actively opposed the notion of being ruled by technology. The invasion scenario effectively changed the contemporary and future societies depicted in these stories from 'risk societies' — in which science and its products are viewed as potentially life-threatening because the base standard of living is already high — to being 'scarcity societies' — in which science and its products are largely viewed as potential life-enhancers because the base risk of death and suffering is relatively high (Beck, 1992). This threat rendered fairly trivial any 'risk society'-level discussion of the problems of technology.

The remaining stories from the late '60s were of three main types. Two were adventure stories in futuristic settings. Six were adventure stories that showed technologically 'advanced' peoples using technological means to gain power over less advanced others. While these represented the products of science as potentially frightening, and indeed contained some mad or inhuman scientist characters, they contained no strong didactic message about science, but rather were concerned with exploitation in general.[23] Three others were didactic, emphasising the necessity of scientific knowledge for fighting off scientifically-advanced exploiters (*Fury from the Deep*, *The Dominators* (1968), *The Krotons* (1968-9)) (Table 2), thus defending science for the public good. Along with the 'boffins against invaders' stories, they provided a solid base for the scientism that was to set in with 1970s *Doctor Who*.

Few 1960s stories took on particular science 'issues', aside from the potential ramifications of artificial intelligence, computer control and cyberised bodies already noted. *Planet of Giants* was a strong critique of industrial agriculture and pesticide, seemingly influenced by Rachel Carson's *Silent Spring* (1962). *Galaxy 4* negatively depicted an all-female race of warriors who reproduced by genetic engineering; their

[23] Adventures in futuristic settings: *The Mind Robber, The Space Pirates.* Technological means to gain power: *The Underwater Menace*, *The Macra Terror*, *The Faceless Ones*, *The Abominable Snowmen*, *The Enemy of the World*, *The War Games.*

demise was similar to that of other 'artificial' beings such as the Cybermen in *The Tenth Planet*. A number of stories involved mind control techniques which were frowned upon by the program (*The Keys of Marinus*, *The Macra Terror* (1967), *The War Games*). However, more in depth engagement with controversial issues in science would have to wait until the tenure of Jon Pertwee.

The 1970s: New Scientism

The Doctors of the 1970s

In the late '60s, the *Doctor Who* production team decided to shift the primary setting of the program from the speculative 'space and time' that had heretofore dominated, to Earth in the present (BBC, 2009a). Accordingly, *The Invasion* in Troughton's last season was set in Earth present and featured UNIT, the United Nations Intelligence Taskforce, an organisation devoted to investigating and dealing with alien and unusual phenomena, headed by a likeable character called Brigadier Lethbridge Stewart. This was a set up that would shape the Pertwee era. Between Troughton's last story, *The War Games* (1969), and Pertwee's first, *Spearhead from Space* (1970), the Doctor was exiled to Earth by the Time Lords as punishment for 'getting involved'. His TARDIS was disabled and knowledge of how to fix it was erased from his memory. It was the Brigadier who took care of him, and invited him to be UNIT's scientific advisor. Over half of the Third Doctor's stories substantially featured UNIT, so the organisation and the Doctor's new 'boffin' role in it (Jones, 1997) very much characterised the Pertwee era.

Pertwee's Doctor took the character's scientist status to a new level. At UNIT, the Doctor was forced to use '70s Earth technology like spectroscopes, cyclotrons and analogue-digital converters to solve problems, having little access to his own technology. This allowed viewers a glimpse of real world scientific research institutions — the Royal Society, the journal *Nature*, *The Times* science editor, Oxford and Cambridge Universities were all mentioned — and presented a more 'realistic' image of science and technology than the futuristic and alien settings of the '60s did.

Pertwee's Doctor was vehemently scientistic and pompously moralistic. Unlike his predecessors, he was very establishment, drinking with senior civil servants and ministers at "the club", enjoying fine wines and cheese, and generally behaving like an eccentric aristocrat. He was commonly known as 'the Dandy' Doctor (so nicknamed by Hartnell's Doctor in *The Three Doctors* (1972-3)). Verity Lambert felt that this incarnation broke with the original conception of the Doctor, because he was "always ringing up heads of state" and becoming "very moral, very upright, very dependable", rather than mysterious, childlike and contradictory (in Tulloch and Alvarado, 1983, p. 31).

Technical skill stayed important to the Doctor's character, with many minor plot points resolved by him constructing a gadget or tinkering with technology. Only two of Pertwee's 24 stories were ultimately resolved by science alone though (*Spearhead from Space* and *The Green Death* (1973)), and on both occasions, that was due to human scientists' expertise as much as the Doctor's. In *The Sea Devils* (1972) the Doctor made a weapon to destroy the enemy, but this was a gratuitous use of science because the Navy offered to do the same thing with conventional weapons. His cleverness with intellectual puzzles helped the Doctor reach his destination in *Death to the Daleks* (1974), but ultimately it was a strategically placed bomb that solved the problem.

More often, the Third Doctor's technical expertise was combined with, and often eclipsed by, his faculties of persuasive reason in effecting the solution. While he talked a lot about science, *doing the right thing* featured more prominently in his record of ideological closure. He talked enemies into or out of things with his cool rationality and strong ethical beliefs at the conclusion of eight stories. Five stories were solved by violence, four by voluntary sacrifice (including reified human emotion), and two by some factor intrinsic to and consistent with the problem itself (Figure 3, p. 95).[24]

In the remaining three stories, it was the Doctor's alien nature as a Time Lord that effected the solution. The Pertwee era was the first time the Doctor had been characterised as biologically different from humans aside from the ability to regenerate and his great age, but this has since become an intrinsic part of the character's mythos

[24] Reason solved the problem in *Inferno*, *Terror of the Autons*, *Day of the Daleks*, *The Curse of Peladon*, *The Mutants*, *Carnival of Monsters, Frontier in Space, The Monster of Peladon.* Violence solved *The Silurians*, *The Sea Devils*, *Planet of the Daleks*, *The Time Warrior*, *Death to the Daleks.* Voluntary sacrifice was used in *Colony in Space*, *The Dæmons*, *The Time Monster*, *Planet of the Spiders.* Intrinsic elements of the problem defeated the machine in *The Mind of Evil* and Omega in *The Three Doctors*.

(reviewed in TARDIS Index File, 2009). His alien physique allowed him to withstand stressful space flight in *The Ambassadors of Death* (1970) and to break through an unbreakable time eddy in *Invasion of the Dinosaurs* (1974). His knowledge of time technology enabled him to put the enemy in a time loop — and then escape from it himself — in *The Claws of Axos* (1971). On both the latter occasions, his explanations for these inconsistencies were unconvincing. In *Dinosaurs*, when companion Sarah asked how he did it, she guessed, "Oh, don't tell me. You're a Time Lord." "Quite," was his only reply. In *Axos*, his explanation of time loops was equally weak: "A time loop is, it's . . . um . . . well, it's a time loop. One passes continually through the same points in time. Passes through the same . . . yes." When asked how he escaped from it, the Doctor's answer was, "Well I simply boosted the circuits and broke free". This was the first time that the program had relied upon such 'Time Lord magic' *deus ex machinas* to solve major problems. They have significant implications for the democratisation of science, because they grant undeserved rhetorical power to science by framing omnipotent magic as 'advanced' science.

Tom Baker reintroduced an anti-establishment flavour to the role of Doctor, with his physical appearance resembling that of a student bohemian (Tulloch and Alvarado, 1983). He was irreverent in a way Pertwee never was, always tripping over his long scarf and beguiling strangers with jelly babies. The character retained his extraordinary genius and his almost unfailing belief in the rightness of his actions though:

> Baker developed a Doctor of godlike knowledge and unreasonable actions — both "arrogant and capricious, self-opinionated and irrational", and at the same time, as Verity Lambert complained, possessing "this awful thing of knowing everything and being right about everything". (Tulloch and Alvarado, 1983, p. 130)

Pertwee had preached scientism to companion Jo, trying to turn her into a scientist, and Baker did the same with companion Leela. In both cases, the Doctor was (almost) invariably proved right, and his 'pupil' tried hard to learn her lessons (discussed in Chapter 7). Where Troughton had mocked logic, Pertwee claimed "Everything that's happened in life must have a scientific explanation" (*The Dæmons* (1971)) and Baker noted "To the rational mind nothing is inexplicable, only unexplained" (*The Robots of Death* (1977)). This scientistic flavour imbued 1970s storylines as never before.

While Pertwee's Doctor had an earnest, didactic approach to scientism, Baker's Doctor delivered his lectures on the topic with characteristic flippance, charm and wit. But this irreverent quality did not necessarily equate to turning scientism into a joke. If Hourihan is right (1997), the less didactic approach is more palatable to audiences and therefore may be more likely to persuade. Certainly, in 1981, at least one subset of fans appreciated *Doctor Who* for its technorationalism (Chapter 3, Tulloch and Jenkins, 1995). This suggests the scientistic message of the '70s serials had some significant impact, although the relative efficacy of the didactic and flippant approaches remains unknown.

Baker and Pertwee were then both 'donors' rather than 'heroes' in Vogler's (2007) parlance. Somewhat confusingly though, in Hourihan's (1997) understanding of the hero construct (discussed in Chapter 5), they were heroes of a more classic variety: brave and dashing 'James Bond' types who spent their lives getting into and out of danger but emerging with the same immortality we always knew they had. These Doctors did not learn; they did not need to. It was their job to teach. The Fourth Doctor was not as pompous or earnest as Pertwee's; he entertained viewers by appearing to stumble across solutions serendipitously while meandering along the road less travelled. His stumblings were more affect than genuine incompetence though: quietly but reliably, he possessed confidence in his own intellectual abilities and ethical correctness — or at least, he never let companions or viewers lose their confidence in him.
Where Pertwee's stories were often solved by reason, this took a back seat in the Baker era, resolving only two stories. Fifteen of Baker's 34 broadcast stories in seasons 12-17 were solved by violence, often an explosion but also interpersonal violence. Six were solved through some intrinsic property of the problem or through poetic justice, entrapping baddies in their own evil creations. One was solved by heroic humanist self sacrifice. In five, transparently explained science of varying plausibility solved the problem. Again, two stories were solved by Time Lord magic, and three more were resolved by 'advanced jiggery pokery' bordering on Time Lord magic but supposedly representing sophisticated science (Figure 3, p. 95).[25]

[25] Reason: *The Face of Evil, The Stones of Blood*. Violence: *Revenge of the Cybermen*, *The Brain of Morbius*, *The Seeds of Doom*, *The Hand of Fear*, *The Deadly Assassin*, *The Talons of Weng Chiang*, *The Invisible Enemy*, *Image of the Fendahl*, *Underworld*, *The Ribos Operation*, *The Pirate Planet*, *The Androids of Tara*, *Destiny of the Daleks*, *City of Death*, *The Horns of Nimon*. Intrinsic property/poetic justice: *Genesis of the Daleks*, *Planet of Evil*, *The Android Invasion*, *The Sun Makers*, *The Power of Kroll*, *Nightmare of Eden*. Self sacrifice: *The Ark in Space.* Transparent science: *Robot*, *The Masque of Mandragora*, *The Robots of Death*, *Horror of Fang Rock*, *The Creature from the Pit*. Time Lord magic: *The Invasion of Time*, *The Armageddon Factor*. Advanced jiggery pokery: *The Sontaran Experiment*, *Pyramids of Mars*, *Terror of the Zygons.*

Companions of the 1970s

The Doctor's companions in the early 1970s were all humans from England in the present. This shifted in the late '70s, when the first non-human companion since Susan was introduced, along with the first of two robot companions. In between was a 'savage' from humanity's future. These shifts reflected changes in the thematic orientation of the stories, from the contemporarily relevant moralism of the Pertwee era to the demystified gothic horror and space-oriented fantasy of the Baker era.

Companions in the early to mid '70s brought the focus of the program back to contemporary Western social trends, and either represented establishment conservatism or different brands of liberal individualism. Conservatism was embodied by military companions, including UNIT's leader Brigadier Alistair Gordon Lethbridge Stewart (Nicholas Courtney), an effective soldier who played a straight foil for the Doctor's eccentricity and solved problems the military way. Three other companions rounded out the UNIT team: two friendly junior soldiers Sergeant Benton (John Levine) and Captain Mike Yates (Richard Franklin), and in the Fourth Doctor era, Surgeon Lieutenant Harry Sullivan (Ian Marter), an old-fashioned doctor brought in to care for the Doctor after his regeneration. Liberalism, on the other hand, was embodied by three very different contemporary Earth women. Elizabeth Shaw (Caroline John), known as Liz, was a highly qualified Cambridge physicist and medical scientist employed as UNIT"s scientific advisor in the Doctor's absence. She resented the secondment and the military mentality imposed upon her, having important research of her own to do, and resented even more being demoted to the Doctor's assistant when he took the reins. The klutzy Jo Grant (Katy Manning) replaced Liz in this role even though she was hopeless at science and was constantly lectured by the Doctor on the virtues of rationality. Despite being a fully trained UNIT agent, Jo left UNIT to marry an idealistic, hippy, Nobel-prize winning biologist, cementing her professed allegiance with 'new left' liberalism and alternative lifestyles as well as ideological support for sustainable technology. Following Jo was Sarah Jane Smith (Elisabeth Sladen), an intelligent and brave investigative journalist and vocal feminist, overtly representing a women's liberation perspective. Sarah travelled with the Third and Fourth Doctors for three and a half seasons and has since returned twice in the new series.

Companions in the late '70s did not tend to represent social trends, but embodied different orientations to 'civilisation' and thus to science. After the departure of Sarah, the Doctor met Leela (Louise Jameson), a 'savage' (in the Doctor's charming terminology) from the Sevateem, a tribe descended from a planetary 'survey team' in humanity's future. Leela had a gift for intuition, a warrior's athleticism and weaponry skills, and partly fulfilled script editor Holmes' desire to introduce an 'Eliza Doolittle' type of character who would learn about science from the Doctor (Sullivan, 2009) and become 'civilised' (or not). Leela was followed by two companions at the opposite end of the 'science and civilisation' spectrum: the computer dog K-9 (voiced by John Leeson and David Brierly) and the brilliantly qualified but sheltered young Gallifreyan, Romana, both symbolic of an 'advanced' future destination for humanity although not being human themselves. As a Time Lord (sometimes described as a 'Time Lady'), Romana could regenerate, and did so after her first season. In her first incarnation (Mary Tamm), Romana was a glamorous sophisticate and pompous know-it-all who believed it was her duty to try to reform the Doctor's wild ways. In her second incarnation (Lalla Ward), she was less bossy and more relaxed, and she and the Doctor had a dynamic of smug, elitist self-absorption. In both incarnations, she and the Doctor represented a superior scientific and moral presence in the universe.

In terms of scientific expertise, Liz and Romana were both more qualified than the Doctor, each trained in several fields. Harry was a trained medical doctor. As a computer, K-9 had encyclopaedic scientific knowledge. Sarah was intelligent enough to get her head around scientific ideas when needed. Jo, Leela and the UNIT soldiers were markedly unskilled in science, although Leela's warrior experience taught her anatomy and first aid. The Doctor's Pygmalion complex emerged in attempts to 'reform' both Jo and Leela (Table 1, p. 98).

Science plots, themes and characters of the 1970s

The emphasis on overt science-related 'lessons' and depiction of science and technology-themed settings that had taken off in the late '60s continued into the Pertwee era. Every story in the first two Pertwee seasons included science-related settings and scientist characters, with all but one set among contemporary Earth scientists (Table 3). The program's focus broadened after that, although there was still a heavy emphasis on

Table 3. 1970s serials containing prominent science-themed didactic messages (black or coloured background). 'Collaborator' stories are purple; 'boffins against the invaders' stories are blue; 'scientism' stories are orange. Stories with a demystified gothic horror theme are coloured yellow. Serials with a white background are primarily adventure stories which may or may not contain science and technology elements and characters.

Doctor	Year	Serial title	Scientist characters
3 Jon Pertwee	70	Spearhead from Space	medical staff
		The Silurians	Quinn, Lawrence, Dawson
		The Ambassadors of Death	Cornish, Taltalian, Lennox
		Inferno	**Stahlman, Williams**
	71	Terror of the Autons	Master, radio telescope crew
		The Mind of Evil	**Master, Kettering, Summers**
		The Claws of Axos	Master, Winser, Hardiman
		Colony in Space	**Master, Miners, Holden**
		The Dæmons	Master, Horner, Azal
	72	Day of the Daleks	
		The Curse of Peladon	
		The Sea Devils	Master
		The Mutants	**Jaeger, Sondergaard**
		The Time Monster	Master, Ingram, Stu
	72-3	The Three Doctors	Omega
	73	Carnival of Monsters	
		Frontier in Space	Master
		Planet of the Daleks	
		The Green Death	**Jones, Stevens**
	73-4	**The Time Warrior**	**Linx, Rubesh**
	74	**Invasion of the Dinosaurs**	**Whitaker, Butler**
		Death to the Daleks	
		The Monster of Peladon	
		Planet of the Spiders	
4 Tom Baker	74-5	Robot	Kettlewell, Winters
	75	The Ark in Space	Vira
		The Sontaran Experiment	**Styre**
		Genesis of the Daleks	**Davros, Ronson, Gharman, Kaled scientists**
		Revenge of the Cybermen	
		Terror of the Zygons	
		Planet of Evil	**Sorenson**
		Pyramids of Mars	Marcus Scarman, Laurence Scarman
		The Android Invasion	Kraals
	76	The Brain of Morbius	Solon
		The Seeds of Doom	Chase, Keeler, Stevenson, Antarctic crew
		The Masque of Mandragora	Giuliano
		The Hand of Fear	Eldrad, Medic, Carter, Watson, Jackson
		The Deadly Assassin	
	77	**The Face of Evil**	**Xoanon**
		The Robots of Death	**Taren Capel, Chub, sandminer crew**
		The Talons of Weng-Chiang	Greel, Litefoot
		Horror of Fang Rock	
		The Invisible Enemy	Marius
		Image of the Fendahl	Ransome, Colby, Stael, Fendelman
		The Sun Makers	
	78	Underworld	
		The Invasion of Time	Rodan
		The Ribos Operation	**Binro**
		The Pirate Planet	Queen
		The Stones of Blood	Rumford
		The Androids of Tara	Lamia
	78-9	**The Power of Kroll**	**Technicians**
	79	The Armageddon Factor	Drax
		Destiny of the Daleks	Davros
		City of Death	Scaroth, Kerensky
		The Creature from the Pit	**Engineers**
		Nightmare of Eden	**Tryst**
	79-80	The Horns of Nimon	
	80	(Shada)(not broadcast)	(Chronotis, Skagra, Chris, Claire)

science topics into Pertwee's last season, with some strong didactic lessons. One story revisited the theme of preventing historical progress from being 'unnaturally' accelerated (*The Time Warrior* (1973-4)). Two new themes also gained prominence in this era. First, a scientistic theme developed in three stories, portraying mystical beliefs as the root cause of a society's problem (*The Dæmons*, *The Curse of Peladon* (1972), *Death to the Daleks*). Second, a 'new left' environmental anti-progress theme is evident in seven stories, though as in the '60s, 'controlled' science was used to defeat 'out-of-control' scientists and products of science (*The Silurians* (1970), *Inferno* (1970), *The Mind of Evil* (1971), *Colony in Space* (1971), *The Mutants* (1972), *The Green Death*, *Invasion of the Dinosaurs*).

The 'collaborator' and 'boffins agains the invaders' themes continued to be used, but these differed from the '60s 'collaborator' and 'boffin' stories in a number of ways. Only in two collaborator stories was the enemy defeated through reified emotion (*The Dæmons*, *The Time Monster* (1972)). More often, plots were resolved through persuasive reason, violence, or the Doctor's technical skill. None of the boffin stories involved teams of scientists and technicians: gadgets and weapons were created almost solely by the Doctor, though he acted in a boffin-like capacity, using contemporary Earth technology. In all but one collaborator story, the scientist collaborating with the invaders was the Doctor's nemesis and evil genius, the Master (Table 3). This repeated plot device gave such stories a less scientific feel from the collaborator stories of the '60s. The Master's goal was usually world/universe domination, his scientific prowess largely incidental.

In addition, the 'invading' enemies in the 'boffins' stories were not technologised, in marked contrast to those of the '60s. Rather, they were all organic creatures whose scientific skill lay in manipulating organic materials including plastic. None of these stories involved Daleks or Cybermen: people who did collaborate with Daleks and Cybermen in the 1970s were never scientists.[26] This change, going hand in hand with the Doctor's adoption of scientism, signifies a shift away from fear of the ultrarational and its defeat through liberal humanism, towards fear of the organic 'female' and its defeat through masculinist science. The most obvious story to associate invading aliens

[26] Moore and Stevens (2007) consider *Genesis of the Daleks* to be a collaborator story, but its engagement with science ethics issues is so complex that I have placed it in a different category for this analysis. The so-called collaborators are in fact the creators of the Daleks, which also gives them a different relationship to the Daleks than Lesterson, Janley, Maxtible and Waterfield in the Troughton stories *The Power of the Daleks* and *The Evil of the Daleks*, who more straightforwardly sought power or knowledge in exchange for the collaboration.

with femaleness is *The Claws of Axos*, in which a gestalt race, the Axons, attempt to invade the Earth by stealth, entrancing (male) human scientists with their exotic beauty and offering wondrous gifts that promise to feed the world. Their ship — also part of the gestalt — is a clammy organic chamber mostly buried beneath the Earth. Its surface entrance is oval shaped with a toothed circular door in the centre: a *vagina dentata*. The Doctor seems to despise the Axons, calling them a "cosmic bacteria". The invading Zygons in *Terror of the Zygons* (1975) also possess organic technology that looks more grown than built. Although the lead Zygon is played by a male actor, the second has a female voice (uncredited), all of them whisper to speak, and their general appearance is grotesquely organic, neither technologised nor particularly masculine. The Zygons are dependent on the "lactic fluid" of a dinosaur-like creature, adding to the feminine referents in the serial.

The remaining Pertwee era stories sometimes involved scientist characters or science-related settings, such as the space program (*The Ambassadors of Death*) or a miniature zoo (*Carnival of Monsters* (1973)), but their plots focused on non-science themes such as not judging by appearances, resisting tyranny and exploitation, or facing the consequences of our actions.[27]

The Tom Baker era involved fewer science-themed plots than the Pertwee era, although stories often contained prominent science and technology elements including scientist characters. While the Letts-Dicks production team responsible for the entire Pertwee era had been noted and sometimes criticised for their 'moralistic' ethos (BBC, 2009a), the first Baker era production team of Hinchcliffe and Holmes preferred a less overtly didactic, 'gothic horror' aesthetic. The result was the most popular era in the program's history (Gregg, 2004; Outpost Gallifrey, 2003; Sullivan, 2009).[28]

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[27] Not judging by appearances: *The Ambassadors of Death*, *Frontier in Space*. Resisting tyranny and exploitation: *Day of the Daleks*, *Carnival of Monsters*, *Planet of the Daleks*, *The Monster of Peladon*. Facing the consequences of our actions: *The Three Doctors*, *Planet of the Spiders*.

[28] For example, in a 2003 web poll of over 1500 fans, five of the seven 'best' stories were from Holmes' tenure as script editor during the Baker era. Holmes also wrote three of the five. Of the other two, Baker starred in one and Holmes wrote the other. The seven stories were (in order, with Baker's and Holmes' roles as Doctor/writer/script editor noted) *The Talons of Weng Chiang* (Baker/Holmes/Holmes), *The Caves of Androzani* (-/Holmes/-), *Pyramids of Mars* (Baker/Holmes/Holmes), *Genesis of the Daleks* (Baker/-/Holmes), *City of Death* (Baker/-/-), *The Robots of Death* (Baker/-/Holmes) and *The Deadly Assassin* (Baker/Holmes/Holmes). Spots eight to ten were taken by *The Evil of the Daleks*, *Inferno* and *The Web of Fear*, which Baker and Holmes were not associated with, but the number eleven spot was shared by three stories, two of which were from the Baker/Holmes era: *The Seeds of Doom* (Baker/-/Holmes) and *The Ark in Space* (Baker/Holmes/Holmes) (Outpost Gallifrey, 2003). In addition, Baker has been voted "best Doctor" by fans in poll after poll for decades, almost without exception (BBC News, 2006a), and the three seasons (17 serials) of this era garnered the highest average first-broadcast UK viewer figures in the series' history to end 2008, reaching a mean of 10.5 million viewers per episode (Sullivan, 2009).

The '*Doctor Who* twist' on these gothic horror stories was invariably a technoscientific explanation for paranormal phenomena, including the Loch Ness Monster (*Terror of the Zygons*), mummies (*Pyramids of Mars* (1975)), ghosts (*The Talons of Weng Chiang* (1977)), zombies (*Horror of Fang Rock* (1977)) and manifestations of ancient deities throughout history (*Pyramids of Mars*, *The Masque of Mandragora* (1976), *The Face of Evil* (1977), *Image of the Fendahl* (1977), *The Stones of Blood* (1978)). Also explored with a demystifying technoscientific ethos were plots involving a Jekyll and Hyde scenario (*Planet of Evil* (1975)), a Frankenstein scenario (*The Brain of Morbius* (1976)), a homicidal plant monster (*The Seeds of Doom*), and a hallucinatory journey into terror (*The Deadly Assassin* (1976)). These stories implicitly advocated a scientistic outlook that explains all phenomena rationally. This was emphasised with occasional scientistic preaching as a major or minor part of the plot (*The Brain of Morbius*, *The Masque of Mandragora, Horror of Fang Rock*). In other words, this mid-'70s era, while giving the appearance of simple adventure story-telling, in fact has strong messages about science to deliver to audiences (Table 3).

Aside from these, only a handful of 1970s Baker stories dealt with questions about the social role of science. *Robot* (1974-5) was a 'boffins against science out of control' story. *The Sontaran Experiment* (1975), *Genesis of the Daleks* (1975) and *Nightmare of Eden* (1979) all dealt with science ethics. *Planet of Evil*, like Pertwee's *Inferno*, dealt with the risks encountered when scientists try to exploit forces not fully understood. *The Face of Evil* and *The Robots of Death* revisited questions raised in the '60s about the wisdom of building a society dependent upon artificial intelligence. *The Power of Kroll* (1978-9) was the last '70s story to deal with themes of colonialist exploitation and mining, themes which had first arisen in Season 1's *The Sensorites* and continued to appear. Less prominently, *The Ribos Operation* (1978) contained uncharacteristically ambivalent discourse on issues of enlightenment, and *The Creature from the Pit* (1979) preached on the importance of progress. A number of Baker stories featured memorable portrayals of scientists, including the highly esteemed *Pyramids of Mars*, *The Seeds of Doom*, *The Talons of Weng Chiang* and *City of Death* (1979) (see footnote 28), and some of these are discussed in Chapter 6.

The role of science in stories changed again in seasons 15-17, led by new production teams who were under strict instruction by the BBC to make *Doctor Who* less scary than it had been during the gothic horror period (BBC, 2009a). The production crew

responded by introducing light plots and humour. The ethos moved to futuristic adventure stories coloured by abundant technobabble. The technobabble replaced the scientism of the gothic horror era for establishing a 'scientific' tone, but these stories for the most part do not contain didactic science messages.[29]

Science issues explored in the program in the '70s include nuclear power (usually referred to as 'atomic power') and other energy-related topics, such as solar power and the search for a limitless energy source. Sustainability issues generally had a high presence, including questions about feeding the world and strong critiques of polluting industries. The impacts on indigenous people of colonisation for resource extraction, the scientific control of criminal behaviour, drug addiction, and questions about zoos were also explored. Science fiction stalwarts space travel, artificial intelligence and cloning featured in plotlines, though these were usually not explored as 'issues' in the same way as they were in '60s *Doctor Who*.

The interest in examining the moral implications of technology, particularly pertinent in the early '70s, coupled with a philosophical bent towards scientism throughout the decade, reflects real world trends as noted by Dorothy Nelkin (1979, p. 10), who contemporaneously observed a "flare-up of disputes over science and technology" alongside a very high level of public esteem for scientists in the West. She interprets this seemingly contradictory state of affairs in part as a consequence of the politicisation of young scientists during the 1960s, and thus as a conflict over the political role of science:

> the protests [...] may be less against science and technology than against the power relationships associated with them; less against specific technological decisions than against the declining capacity of citizens to shape policies that affect their interests; less against science than against the use of scientific rationality to mask political choices. (Nelkin, 1979, p. 11)

Whether *Doctor Who*'s representation of science mirrors such appeals for the democratisation of science is a question for this thesis.

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[29] Such stories include: *The Invisible Enemy*, *The Sun Makers*, *Underworld*, *The Invasion of Time*, *The Pirate Planet*, *The Androids of Tara*, *The Armageddon Factor*, *Destiny of the Daleks*, *The Horns of Nimon*.

The 1980s: Postmodernist Pluralism

The Doctors of the 1980s

The four '80s Doctors were very different creatures. Both Fourth and Sixth Doctors clearly identified as scientists, but while the former became generously pluralist in his final season, the latter was opinionated and bullying. Neither the Fifth nor the Seventh Doctors named themselves scientists at all, but with different implications: it rendered the Fifth powerless and fallible, but imbued the Seventh with mystery that was picked up in the new series.

In his final season, Tom Baker's Doctor retained his extraordinary charismatic gravitas, and this alone sets him aside from the three Doctors to follow. But in a major departure from his own precedent, he became fallible and indeed mystical in Season 18. In *Full Circle* (1980) he agreed it was "certainly true" that he didn't know everything and in *The Keeper of Traken* (1981) he speculated, "Wouldn't it be nice to be right about everything?" in genuine humility. In *State of Decay* (1980), he claimed, "Knowing's easy. Everyone does that ad nauseum. I just sort of hope", while in *Warriors' Gate* (1981) he stated, "One good solid hope's worth a cartload of certainties". This Doctor also gave a peasant community in *State of Decay* a choice about becoming a highly technological society, in contrast to the stagist determinism heretofore reinforced within the program. He continued to identify with the label scientist, but failed to think of solutions more often than before, reduced to humorously claiming others' ideas as his own in underhanded acknowledgement of their skills.

The personality of Peter Davison's Doctor was gentle if slightly quietly grumpy. His era was often dominated by the concerns and challenges faced by companions, so he often took a backseat, compared to the scene-stealing charisma of Tom Baker and Pertwee. He was a fallible hero — Tulloch and Alvarado (1983) decribe him as a 'vulnerable action-hero' — who literally failed to save the day on more than one occasion, with the result that many people died in his stories through the sheer magnitude of the problem. He was no magician; his sonic screwdriver was destroyed early in his tenure, removing this quick fix solution to problems. His companion Adric was the only major

companion ever to die, an event the Doctor could not prevent.[30] This Doctor regenerated saving companion Peri from death after his incomplete knowledge of a planet's ecology led to both of them being dosed with a fatal poison. The Doctor retrieved the antidote, but only retrieved enough for Peri, and it was another scientist who told him where to get it: he did not find the answer himself. Davison's Doctor learned and changed and apologised, admitting, "it seems I must mend my ways" after companion Tegan left the TARDIS traumatised. Science was his training but it was not strongly emphasised as part of his personality. The Fifth Doctor did not claim to be a scientist, did not resolve many problems (or any plots) through science, and was more concerned with the governance of science and technology as well as ethics in general. Little of the 'Time Lord magic' or 'jiggery pokery' appearing in the Davison era involved the Doctor's actions either, so even this form of 'scientific prowess' was largely absent from his persona.

The Sixth Doctor, played by Colin Baker, was an arrogant, violent bully. He treated primary companion Peri badly, calling her evil, implying she was fat, mocking her manners of speech and her ignorance, patronising her insights, and terrifying her on one occasion by dragging her into an alcove with his hand over her mouth for no good reason. He calmed down a little with time, but this situation set up a nasty dynamic never seen before or since in *Doctor Who*. Hartnell was wicked and slippery at first, but he had three companions who protected each other. Peri was subjected to the Doctor's erratic temper alone and was unable to effectively fight back. This extended to the Doctor's engagement with science too, which was much more prominent than in the Davison era. When in *Timelash* (1985) Peri asked if a particular phenomenon was bad, he shouted at her abusively, despairing, "You don't seem to realise the effect that time particles colliding within a multi-dimensional implosion field can have." Hardly, as Peri herself replied. He preached, "It's the province of knowledge to speak and the privilege of wisdom to listen". At the same time, this Doctor developed a habit of refusing to explain his actions: "I'll explain later" or "I'll explain one day" became his catch phrase. Rather than coming across as irreverent or mysterious, this merely added to his image as an unpleasant, elitist know-it-all. He was shown to be fallible on occasion, which helped to moderate this. But unlike Hartnell's Doctor, he was never forced to apologise for his failures and thus grow and change. A line from *The Mark of the Rani*

[30] Two minor companions also died: Katarina (appearing in only 4 episodes) in a tragic act of self sacrifice, and the robot Kamelion (appearing only in two stories at the beginning and end of its tenure) was mercifully killed by the Doctor after it had been tortured by the Master.

(1985) sums this up: when asked what he and Peri did in the TARDIS, the Doctor's response was "Argue, mainly". The line is humorous but accepting of the unfortunate circumstance that the Doctor is a bully, like it or not.

Sylvester McCoy's Doctor cultivated an air of mystery. This Doctor had secrets; he had arcane knowledge from the dawn of time. He was not omniscient, but had to struggle to stay one move ahead in the fateful games others were playing. In some cases this Doctor discovered things about himself he didn't know, such as the fact that in some future lifetime he might be the Merlin of Arthurian legend. In other cases he was called to account in no uncertain terms for withholding information, and thus was represented with an ambivalence similar to that framing Hartnell and Troughton: this Doctor was basically a good sort but was by no means perfect. Like Hartnell, Troughton and Davison — and unlike Pertwee, Tom Baker and Colin Baker — McCoy's Doctor apologised for his mistakes.

The Seventh Doctor's personality foreshadowed the new series (and to some extent followed in Tom Baker's footsteps) in that he appreciated the random, irrational and redundant: he valued Elvis and Mrs Malaprop, he hated bus stations and burnt toast. Like Davison, McCoy had a gentle approach, and in most of his era, his primary companion Ace shone more brightly than he. Mostly he got on with whatever work needed to be done in the background while Ace faced her demons and enjoyed her victories in the foreground. Like Davison, McCoy's Doctor never claimed to be a scientist. But unlike Davison, he did engage in jiggery pokery and Time Lord magic, and rarely in transparently explained science. When asked how he could rewire a piece of alien equipment, his answer was simply, "900 years experience", again foreshadowing the new series. Perhaps through the changes the program and Western society had seen, the atheist and material nature of science proved incapable of holding any mystery, so alternative dramatic techniques were required to revive a sense of the unknown within the character of Doctor.

Plot resolution in the 1980s was effected by 'Time Lord magic' or *deus ex machina* moments in 11 stories. An additional eight stories blur into this category, being resolved through 'advanced jiggery pokery'. The 'advanced jiggery pokery' here positively bloomed, building on that used in a handful of '70s stories to become completely routine. Finally here, it almost completely displaced transparent science, which only

resolved one '80s story. Faculties of reason and persuasion resolved problems in five. Violence was the other major source of resolution in the '80s, resolving 15 stories. Three were resolved through humanist self sacrifice or reified emotion, two through inevitable deaths, and three through semi-mystical means. *Terminus* (1983) was resolved by freeing slaves (Figure 3, p. 95).[31]

Companions of the 1980s

Eighties companions were a mixture of 'futuristic' aliens and women from Earth present. This was the only era to feature alien humanoid companions who were not Time Lords, further developing the notion of a universe populated with peoples more 'advanced' than humanity. Within this universe, 20th century Westerners were characterised as naïve and sheltered, akin to the 'primitivist' characterisation of Highlander Jamie.

In the first half of the '80s, that Earthly parochialism was embodied by companions not from Britain but from its former colonies: Australia and the USA. The Brisbane drawl of 'air hostess' Tegan Jovanka (Janet Fielding) or the faux-Yank twang of botany student Peri Brown (Nicola Bryant) contrasted markedly with the 'civilised' Received Pronunciation (RP) of the Fourth, Fifth and Sixth Doctors and of the 'advanced' alien companions Adric, Nyssa, Turlough and Kamelion. These two Earthlings, even the ostensibly botanically trained Peri, displayed minimal scientific sophistication compared to the aliens, all of whom were highly skilled in science and technology. Adric (Matthew Waterhouse) was a naïve and elitist boy from a different universe and was a mathematical genius. Nyssa of Traken (Sarah Sutton) was a semi-aristocratic alien and an expert in bioelectronics and biochemistry. Mysterious alien Turlough (Mark Strickson) was a technologically competent member of the TARDIS crew by virtue of his alien origins, and Kamelion (voiced by Gerald Flood) was the second robotic companion, following K-9. Both Tegan and Peri were picked on by their

[31] Time Lord Magic: *Warriors' Gate*, *Time-Flight*, *Mawdryn Undead*, *The King's Demons*, *The Awakening*, *The Twin Dilemma*, *The Mark of the Rani*, *Timelash*, *Delta and the Bannermen*, *Remembrance of the Daleks*, *The Greatest Show in the Galaxy*. Jiggery pokery: *The Leisure Hive*, *Meglos*, *Full Circle*, *The Keeper of Traken*, *Logopolis*, *Earthshock*, *The Ultimate Foe*, *Time and the Rani*. Science: *Terror of the Vervoids*. Reason: *Frontios*, *Planet of Fire*, *Vengeance on Varos*, *Battlefield*, *Ghost Light*. Violence: *State of Decay*, *Four to Doomsday*, *The Visitation*, *Black Orchid*, *Warriors of the Deep*, *Resurrection of the Daleks*, *The Caves of Androzani*, *Attack of the Cybermen*, *The Two Doctors*, *Revelation of the Daleks*, *The Mysterious Planet*, *Paradise Towers*, *Dragonfire*, *Silver Nemesis*, *The Curse of Fenric*. Humanist sacrifice/reified emotion: *Castrovalva*, *Enlightenment*, *The Happiness Patrol*. Intrinsic inevitability: *Arc of Infinity*, *The Five Doctors*. Mysticism: *Kinda*, *Snakedance*, *Survival*. *Mindwarp* was unresolved.

respective Doctors for their ‘irrational’ ideas and lack of ‘advanced’ scientific knowledge, but both fought back, presenting important challenges to the Time Lord’s impatience and arrogance.

The conflation of RP-accent and scientific literacy more or less continued in the person of mid-'80s companion Mel (Bonnie Langford), a computer programmer and health fanatic from Pease Pottage, England, though Mel spent more time screaming than programming computers. The final '80s companion, Ace (Sophie Aldred), was considerably different from those who came before her, being a more developed character in terms of both her personal history and her relationship to science (see Orthia, in press-b, Appendix D). As such she did not contribute to the ‘advanced-primitive’ discourse, but rather disrupted it. She became the focus of numerous serials during her two and a bit season tenure, allowing the Doctor to dwell mysteriously in the background shadows. Ace was a sixteen year old working class tomboy from Perivale in London’s western suburbs who used contemporary slang such as ‘ace’ and ‘Gordon Bennett’ and ‘scumbag’. She was also an explosives enthusiast who resented scientific authority figures and negotiated her own scientific education. Accordingly, Ace failed her school chemistry exams but taught herself what she needed or wanted to know, so was a semi-competent amateur with some technological skill (Table 1, p. 98).

Science plots, themes and characters of the 1980s

Most 1980s serials contained at least one scientist character — only eight out of 50 did not — but this did not translate into prominent science themes throughout the decade. Thirty one stories were primarily adventure tales involving escaping danger, fighting evil, solving mysteries and exploring speculative philosophical ideas (Table 4).

This leaves nineteen didactic serials about science. Two showcased the power of mathematics to construct material realities (*Logopolis* (1981), *Castrovalva* (1982)), contributing a semi-educational approach rare after the 1960s. Five explored the importance of the democratisation of science for democracy, though following slightly different paths: *Full Circle* and *Frontios* (1984) asked questions about the ethics of sharing uncertain knowledge; in *State of Decay* and *Terminus* the elitist hoarding of scientific knowledge was unequivocally criticised; while in *Time and the Rani* (1987)

Table 4. 1980s serials containing prominent science-themed didactic messages (black or coloured background). The single 'scientism' story is orange and the 'automated error' story is olive. 'Democratisation of science for democracy' stories are red. Stories embracing religious or mystical alternatives to science are green. Bleak stories of the decay and abuse of science and technology under negligent or corrupt governance are lavender. Serials with a white background are primarily adventure stories which may or may not contain science and technology elements and characters.

Doctor	Year	Serial title	Scientist characters
4 Tom Baker	**80**	**The Leisure Hive**	**Pangol, Hardin**
		Meglos	Meglos, Caris, Deedrix
		Full Circle	Dexeter
		State of Decay	Kalmar, Aukon
	81	Warriors' Gate	
		The Keeper of Traken	Tremas
		Logopolis	**Master, Monitor**
5 Peter Davison	**82**	**Castrovalva**	**Master, Mergrave**
		Four to Doomsday	Monarch
		Kinda	Todd
		The Visitation	Terileptil
		Black Orchid	George Cranleigh
		Earthshock	Kyle
		Time Flight	Master, Hayter
	83	Arc of Infinity	Omega
		Snakedance	Ambril, Chela, Dojjen
		Mawdryn Undead	Mawdryn
		Terminus	Garm
		Enlightenment	
		The King's Demons	Master
		The Five Doctors	Master
	84	Warriors of the Deep	Solow, Maddox
		The Awakening	
		Frontios	Range, Norna
		Resurrection of the Daleks	Davros, Laird, Styles, Kiston
		Planet of Fire	Master
		The Caves of Androzani	Sharaz Jek
6 Colin Baker		The Twin Dilemma	Romulus, Remus, Azmael
	85	Attack of the Cybermen	
		Vengeance on Varos	Quillam
		The Mark of the Rani	**Rani, Master, George Stephenson**
		The Two Doctors	**Dastari, Chessene**
		Timelash	Borad
		Revelation of the Daleks	Davros
	86	The Mysterious Planet	
		Mindwarp	Crozier
		Terror of the Vervoids	**Lasky, Bruchner, Doland**
		The Ultimate Foe	
7 Sylvestor McCoy	87	Time and the Rani	**Rani**
		Paradise Towers	
		Delta and the Bannermen	
		Dragonfire	
	88	Remembrance of the Daleks	Jensen, Williams
		The Happiness Patrol	Gilbert M, Earl Sigma
		Silver Nemesis	Mathematician
		The Greatest Show in the Galaxy	Captain Cook
	89	Battlefield	Warmsley
		Ghost Light	**Josiah, Light**
		The Curse of Fenric	**Judson**
		Survival	Master

people oppressed by science made a choice to reject the help of a scientist in their path to liberation. One story presented a scientistic message about the dangers of superstition (*Planet of Fire* (1984)). Three did the opposite, presenting much more circumspect perspectives on scientism and truth, and to some extent embracing mysticism or religion (*Meglos* (1980), *Kinda* (1982), *Snakedance* (1983)). Five stories focused on the consequences of unethical or dangerous scientific research (*The Leisure Hive* (1980), *The Mark of the Rani*, *The Two Doctors* (1985), *Terror of the Vervoids* (1986), *Time and the Rani*). One explored the environmental risks of industrial progress and government sanctioned weapons development (*The Curse of Fenric* (1989)), another presented a complex critique of the classificatory worldview inherent in biological taxonomy (*Ghost Light* (1989)), and a third discussed the nature of enlightenment and the limitations of supposed omniscience (*Enlightenment* (1983)). The main science issues explored in the '80s were genetic engineering and cloning, vivisection and animal rights, and technologies of warfare.

A number of serials provided powerful reflections on the relationship between science and social governance which were only implicitly didactic. *Earthshock* (1982) was in some ways a 'boffin against the invaders' story, though the boffin was one companion, mathematician Adric, and he died in his successful attempt to save the Earth. *Earthshock*, along with *Warriors' Gate*, *Terminus*, *Warriors of the Deep* (1984), *Frontios*, *Resurrection of the Daleks* (1984), and *Vengeance on Varos* (1985), predicted an aesthetically and morally bleak future for humanity. All these stories were from the Davison era, all evoked depressing chronic misery rather than dystopian horror, and all bar *Terminus* ended with numerous pointless deaths and avoidable suffering. This relatively dark phase in *Doctor Who* coincided with the early-mid years of the prime ministership of Margaret Thatcher, which was allegorically criticised more overtly in 1988's *The Happiness Patrol* (BBC, 2009a), though the latter ended 'happily' with the regime toppled, and without pointless deaths. These bleak stories all showed humans (or human-like people) living in future high-tech environments, but they utterly lacked the cornucopian idealism of the 1960s 'boffins' stories: the technology was industrial rather than shiny and it often did not work properly. As Tegan put it in *Warriors of the Deep*, "progress doesn't seem to have solved anything." Most importantly, these stories imputed responsibility for the decay and abuse of potentially great science and technology to banally neglectful or corrupt systems of governance of science and

society, with the governors mostly remaining unseen. The problem was thus represented as systemic rather than individualised.[32]

Hand in hand with this is the fact that while these stories depicted horrendous science-related phenomena, these were often merely incidental components of the horrendous settings. For example, *Terminus* included discomfiting representations of drug addiction, but it was not *about* drug addiction. *Resurrection of the Daleks* involved two separate representations of horrifically deforming biological weapons, but it was not about the ethics of biological weapons. This unremarked-upon, routine use of technology that disturbs the normative moral compass of contemporary Westerners sediments the impression of a hard life to come. Unlike in previous *Doctor Who* serials, here the Doctor did not effect a comfortable resolution, because the situation has changed and pat answers telling us to 'say no to harmful technology' no longer sufficed.

The contrast with the cornucopianism of the 1960s 'boffins' stories is starkly illustrated by the literal boffin character in *The Curse of Fenric*, Dr Judson. Judson is an Alan Turing-like mathematician who has invented a code-breaking machine during the Second World War. It is used to decode Nazi cyphers, but he and his military commander Millington plan to let the Russian army steal it, and to set off a built-in chemical bomb once the machine is inside the Kremlin, causing untold death and suffering. Judson is also implicated in a plan Millington has for dropping deadly chemical bombs on Germany to end the war. He is ultimately taken over by the evil force Fenric and killed. Judson represents the ugly side of scientific collaboration with government in a time of war: he is a marked contrast to the heroic boffin characters from post-war British films (Jones, 1997).

Other 1980s serials presented a clear statement of ambivalence about scientism and mysticism. The second 1980s story, *Meglos*, contained equivocal messages about religion: it depicted ideological battles between the scientistic Savants and the religious Deons, and categorised the Doctor as "A little of each and a good deal more of something else." Following *Meglos*, in *State of Decay*, the Fourth Doctor equated the terms "witch wiggler" and "fortune teller" with "scientist", exhibiting a marked pluralist

[32] A number of other serials presented a similar bleak aesthetic but were more explicitly dystopian stories about corrupt political regimes and oppression. Rather than evoking a backgrounded 'depressingly inevitable future', they evoked a foregrounded 'this is what happens when bad people come to power', so they are not of the same interest here: *The Caves of Androzani*, *Attack of the Cybermen*, *Revelation of the Daleks*, *Mindwarp* and *The Happiness Patrol*.

transformation in contrast to the rationalist approach to knowledge he favoured in his early years. In *Warriors' Gate* he defended the *I Ching* when Romana labelled it superstition. In the following season, *Kinda* partially embraced mysticism, and this combined with its complex critique of colonialism has garnered concerted attention from *Doctor Who* scholars (Charles, 2007; Tulloch and Alvarado, 1983). *Kinda*'s sequel, *Snakedance*, proposed a partially mystical solution to its problem without trying to disguise mysticism as Time Lord science. Both these stories were heavily laden with references to Buddhist concepts. In *The Mark of the Rani*, the Doctor's objections to a biotechnologist's unethical science included the fact that "there's no place for the soul in her scheme of things". In *Battlefield* (1988), characters from the King Arthur legends appeared from another dimension and performed magical acts including healing the blind with the touch of a hand and crashing a helicopter with the zap from a finger: none of this was rationalised by the Doctor. Capping this off was the Harawayesque embrace of the partial against the omniscient in *Enlightenment* and *Ghost Light*. In *Enlightenment* the Doctor met the Eternals, a race who live outside time and can create matter at will, but who are intellectual parasites, because their limitless power extinguishes creativity, and thus there are ideas they can never think of despite their omniscience. In *Ghost Light*, a bizarre assortment of characters was each granted legitimacy in their diverse views of what constitutes reality; all but the cosmic taxonomist, Light, whose universalist and fixed classificatory gaze was found utterly wanting. All of this ensures that the 1980s stands out as a marker buoy of changing tides in the history of *Doctor Who* from scientism to pluralism.

This sophisticated engagement with notions of truth, alongside the sophisticated engagement with issues of science governance and the democratisation of scientific knowledge noted above, was also accompanied by sophistication in engagement with scientific concepts in stories such as *Logopolis* and *Castrovalva*, and later, *Ghost Light*. Neither the scientistic rationalism of the early '70s nor the technobabble of the late '70s was required to create a science-oriented feel in these stories: hard science was present in all its impenetrable glory, but in each case provided a fascinating showcase of what science can do. In *Logopolis* and *Castrovalva*, mathematics was shown to be capable of literally building and changing material phenomena, via a method called 'block transfer computation'. While some reviewers suggested this complex science may have been offputting for viewers, for others it was a joy (Cornell et al., 1995; Howe and Walker, 2003). *The Mysterious Planet* (1986) also contributed to the mystique of science. This

‘automated error’ story set a new trend that would become well-used in the new series, depicting an automated life support system that inadvertently caused human suffering simply by following its narrowly defined orders in a new set of circumstances. Rather than a warning against artificial intelligence, this story trod gently with science, showing it to be wondrously good at saving humans from disaster, and that the reason it went wrong here was because it was so reliable.

This extraordinary complexity of '80s *Doctor Who* provides ample fodder for discussions about the democratisation of science.

The 2000s: The Cult of Doctor

The Doctors of the 2000s

Christopher Eccleston only played the Doctor for one series of 13 episodes. Chapman (2006) describes his characterisation as corresponding to an archetype of wounded veteran, emerging as he did out of the slaughter of the Time War, which all but killed his people. This fact and a fresh approach to the program in the new series enhanced the mythic qualities of the Doctor. The Ninth Doctor was adept at what he called ‘jiggery-pokery’ and maintained the Doctor’s habit of proclaiming his own genius, but like the Fifth and Seventh Doctors, he departed from the program’s origins in never claiming to be a scientist or a practitioner of science, a departure that continued through the Tennant era. In *Dalek* (2005) he stated, “I don’t need to make claims. I know how good I am.”

His alienness was emphasised to a greater extent than before, and his various talents and genius were mystified through that. Like Pertwee and Tom Baker before him, this Doctor possessed an otherworldly omniscience: he could sense the Earth orbiting the Sun beneath his feet, his “history is perfect” so he could tell when human history had slowed down or sped up ‘unnaturally’, he could see and feel everything and it hurt. He insisted to companions and others that he knows what he’s doing and they don’t. This Doctor disliked people who were frightened or sheltered, who questioned or disobeyed him, and he was rude to people for this reason. He retained his mystery partly to maintain his power. As his enemy stated in *The Long Game* (2005): “That’s why you’re so dangerous. Knowledge is power, but you remain unknown.”

David Tennant's Doctor was more friendly. He embraced all things human, particularly the seeming trivialities of human life, which he celebrated as triumphs of human irrational creativity. Everything from the edible ball bearings on cakes to humanity's persistence at the end of the universe received a shout of celebratory joy. Nonetheless, he was still burdened by specialness, explaining to companion Donna:

> Cos that's how I see the universe. Every waking second I can see what is, what was, what could be, what must not. That's the burden of a Time Lord, Donna. And I'm the only one left.

Like Tom Baker, Tennant managed to carry irreverence and gravitas, curiosity and omniscience, simultaneously.

Both Doctors espoused a sense of adventure and curiosity as the reason for travelling. The Ninth said he travels "to see history happening right in front of us". The Tenth said he kept going because of "the fear, the joy, the wonder". This pushes the character back towards the 'scientist adventurer' stereotype that Haynes (1994) classified him as, though perhaps without the science orientation. Tennant's Doctor was labelled a scientist by someone else when he called himself a doctor "of everything", and was accused of always reducing things to science and spoiling it, but never called himself a scientist. Again, he refused to answer the question, "Doctor of what exactly?". He did proclaim himself a genius, clever or special several times. Unusually, he engaged in medical doctoring, even when another doctor was on the scene (companion Martha), telling her "leave it to me I'm a doctor". Essentially it was his mysterious alien brilliance that granted him his substantial authority, even over those with superior qualifications.

The new series rebuilt the legend of the Doctor, right from the first episode, through the words of short-lived character and Doctor fanatic, Clive: "The Doctor is a legend woven throughout history. When disaster comes, he's there. He brings a storm in his wake. And he has one constant companion — death."

This grew to new levels in the Tenth Doctor era, with the Doctor acquiring a god-like status. He was variously called a "lonely god", "the oncoming storm", an "angel". In Series 3, two characters eulogised him, including companion Martha:

> He's like fire and ice and rage. He's like the night and the storm and the heart of the sun. He's ancient and forever. He burns at the centre of time and he can see the turn of the universe. (*The Family of Blood* (2007))

> His name is the Doctor. He has saved your lives so many times and you never even knew he was there. He never stops. He never stays. He never asks to be thanked. But I've seen him. I know him. I love him. And I know what he can do. (*Last of the Time Lords* (2007))

The finale of Series 3 had the whole of humanity thinking 'Doctor' at the same time in a powerful prayer (amplified by a telepathic field) that saved the Earth. Series 4 had the Doctor and companion Donna literally worshipped as household gods by a Pompeiian family, and sent off with their very own hymn by the formerly enslaved alien Ood. This religious flavour permeated the new series, shifting the focus decidedly away from science: it was neither the explorative ambivalence of the '60s, the atheist scientism of the '70s, nor the political post-modernism of the '80s, it was myth-building hero worship of one special man. Mason (2009) appropriately characterises his persona as that of faith healer.

Symptomatic of this are the patterns of plot resolution in the new series. 'Time Lord magic' played a prominent role. For example, Eccleston's Doctor regenerated after saving the life of companion Rose with a lengthy kiss: supposedly a technique for extracting toxic energy from her body and absorbing it into his own. The Doctor's sonic screwdriver acquired a very obvious magic wand role as numerous fans have observed; the program itself effectively admitted as much in *Partners in Crime* (2008), when Donna's mother remarked to her daughter, "No one's gonna come along with a magic wand and make your life all better", just before the Doctor came back into Donna's life and did just that. Nine of the 43 new series stories were resolved with unexplained *deus ex machinas* usually attributed to the Doctor's alienness. This was often accomplished with self-consciousness and humour that acknowledged the speculative premise of the program rather than pretending it was 'advanced' science: for example, in *Blink* (2007), the Doctor showed off a gadget critical to the plot, saying, "This is my timey-whimey detector. It goes bing when there's stuff." As in the '80s, blurring into this were a further seven serials resolved through 'jiggery pokery'. One story was resolved through (dubious) explained science, two through reason, four through violence, and seven

through some intrinsic factor or inevitability of the problem itself. *Planet of the Ood* (2008) was resolved by freeing slaves. Twelve were resolved through humanist self sacrifice or reified emotion, a higher proportion than any other era (Figure 3, p. 95).[33]

The life-saving kiss in question has an additional significance: the new series was the first time that sexual involvement between the Doctor and companions was explicitly depicted. Sex and romance had been fairly taboo in the classic series. In the Davison era, crew were careful to avoid any hint of the "sexy young" Doctor being sexually involved with either Tegan or Nyssa, so these characters rarely touched (Tulloch and Alvarado, 1983). The only exceptions to asexuality in the classic series were subtextual. For example, Tom Baker and Lalla Ward were romantically involved while starring in *Doctor Who* together, and that real-life chemistry overflowed onto the screen in stories such as *City of Death*. As with other science fiction programs such as *Star Trek* (Penley, 1997; Tulloch and Jenkins, 1995), classic series *Doctor Who* also contained a layer of homoerotic subtext in places (see Darlington, 2007; Nyder, 2006), but this was never canonical. Aside from these subtleties, it was the 1996 TV Movie that broke the 'romance' taboo: at the time it was so noteworthy that "The Doctor kisses a lady" was listed as a continuity point of the film by *Doctor Who* popular scholars (see BBC, 2009a). This paved the way for Doctor-romance in the new series, including his implicit involvement with both female and male companions.

Companions of the 2000s

The treatment of companions in the new series was noticeably different from the classic series not only because of the possibility of romance, but because viewers were allowed substantial insight into the homelife of companions. The new series had a realistic, contemporary feel that the classic series lacked: characters ate chips, they read magazines, they complained about trivial matters and had bodily functions (e.g. the 'farting' alien Slitheen in *Aliens of London* (2005)). All companions from the new series

[33] Time Lord magic: *The Unquiet Dead*, *Boom Town*, *Bad Wolf*, *Love & Monsters*, *Army of Ghosts*, *The Lazarus Experiment*, *Utopia*, *Silence in the Library*, *The Stolen Earth*. Jiggery pokery: *Rose*, *The End of the World*, *New Earth*, *The Idiot's Lantern*, *Gridlock*, *Voyage of the Damned*, *Partners in Crime*. Science: *The Sontaran Stratagem*. Reason: *The Long Game*, *The Doctor's Daughter*. Violence: *Aliens of London*, *The Christmas Invasion*, *The Impossible Planet*, *The Runaway Bride*. Intrinsic inevitability of the problem: *Tooth and Claw*, *School Reunion*, *The Girl in the Fireplace*, *The Shakespeare Code*, *42*, *Blink*, *The Fires of Pompeii*, *Planet of the Ood*. Self sacrifice or reified emotion: *Dalek*, *Father's Day*, *The Empty Child*, *The Rise of the Cybermen*, *Fear Her*, *Smith and Jones*, *Daleks in Manhattan*, *Human Nature*, *The Unicorn and the Wasp*, *Midnight*, *Turn Left*, *The Next Doctor*.

up until end 2008 were human, with all but one from Earth present. In this they contrasted far more starkly with the new series' godlike, alien Doctor than companions ever had in the classic series.

The exception was companion Captain Jack Harkness (John Barrowman), a pathologically flirtatious, bisexual, time-travelling con artist from Earth's future with a liking for advanced technology. After being killed and brought back to life at the end of Series 1, Jack became immortal, and went on to play the lead role in the *Doctor Who* spinoff *Torchwood*, so in many ways became a mysterious and semi-omniscient Doctor-like figure himself. Jack was the first and only man to share a kiss with the Doctor.

The other new series companions were all contemporary Londoners. Rose Tyler (Billie Piper) was a 19 year old working class south Londoner who worked in a shop and lived on a housing estate with her pension-dependent mother Jackie Tyler (Camille Coduri). She had an affectionate but dull relationship with boyfriend Mickey Smith (Noel Clarke), but ultimately found love with a part-human clone of the Doctor, having been in love with the Time Lord for some time. Martha Jones (Freema Agyeman) was a medical student about to complete her internship when she met the Doctor at an inner city hospital. She was assertive, intelligent, and ultimately displayed acts of tremendous courage and stamina. As a black woman, she encountered racism on occasion, a first for a *Doctor Who* companion. Like Rose (and Jack), Martha fell in love with the Doctor, but unlike for Rose (and as for Jack) that love was unrequited. Finally, Donna Noble (Catherine Tate) was a ginger-haired temp from Chiswick in her thirties who was compassionate and loud-mouthed, sticking up for the oppressed whenever the Doctor forgot to. Unlike Rose, Martha and Jack, Donna was not in love with the Doctor, and was represented as frumpy: even Jack refused to hug her in one scene. Instead, she had aspirations to become omniscient like him, but these were dashed when her biology was found to be inadequate (discussed in Chapter 7).

Following on from the characterisation of Ace in the 1980s, all of these companions were marked by their situatedness within real, contemporary British life: they were ordinary in some way or other that was very specific to time and place. The Doctor's presence in their lives was represented as a gift, improving their lot, bringing out the best in them, allowing them to blossom, and in their different ways all admired and loved and in some cases exalted him. The Doctor-companion relationship was thus very

much an unequal one, the manifestation of different versions of a saviour fantasy. Two serials also featured minor companion Adam Mitchell (Bruno Langley), a condescending self-declared genius whom the Doctor evicted from the TARDIS for profiteering from his knowledge of the future. This incident reveals the other side of the godlike Doctor coin: he who does not tolerate transgressions of his moral framework and sorts the good from the bad.

Martha and Adam were the only formally trained scientist companions in the new series. Jack was technocompetent by virtue of being from the future. Mickey was an informally educated technocompetent character with skills in computer hacking. Rose, Donna and Jackie were characterised as scientifically illiterate, though Rose and Donna acquired some scientific knowledge while involved with the Doctor (Table 1, p. 98).

Science plots, themes and characters of the 2000s

As in the 1980s, the new series of *Doctor Who* had a striking minority of stories 'about' science. Only 14 of the 43 had didactic messages to tell about science (Table 5). The rest focused on other things, including adventures in time, explorations of personal and institutional ethics, speculative ideas about reality, and stories of emotional growth. The new series was broader in genre than the classic series and spent much more screen time on the personal lives, stories and feelings of companions. Such issues were underplayed and understated in the classic series, whereas the new series milked these appeals to pathos for all they were worth. It is possible to proffer numerous reasons for the program's renewed popularity, but I suggest that this is one of them: it does an excellent job of engaging audiences on multiple levels, including the intellectual and emotional.

The new series saw the return of the 'collaborator' theme. *Dalek* was the first 'collaborator' story since the Pertwee era, and the first since 1970 to feature a scientist other than the Master as the collaborator. It was resolved by reified human emotion, as were *Daleks in Manhattan* (2007) and *The Next Doctor* (2008), though their collaborators were not scientists. *Rise of the Cybermen* (2006) contained echoes of (and direct references to) 1968's *The Invasion* and 1975's *Genesis of the Daleks*, in that it concerned the creation of a 'classic' *Doctor Who* cyborg enemy defeated by reified human emotion. It thus partly qualifies as a 'collaborator' story, but like *Genesis of the*

Table 5. 2000s serials containing prominent science-themed didactic messages (black or coloured background). 'Collaborator' stories are purple. The 'scientism' story is orange. The 'demystified horror' story is yellow. 'Automated error' stories are olive. Serials with a white background are primarily adventure stories which may or may not contain science and technology elements and characters.

Doctor	Year	Serial title	Scientist characters
9 Christopher Eccleston	05	Rose	
		The End of the World	Cassandra
		The Unquiet Dead	
		Aliens of London	Sato
		Dalek	Van Statten
		The Long Game	
		Father's Day	
		The Empty Child	Constantine
		Boom Town	
		Bad Wolf	
10 David Tennant		The Christmas Invasion	
	06	**New Earth**	**Sisters of Plenitude, Cassandra**
		Tooth and Claw	
		School Reunion	Krillitanes
		The Girl in the Fireplace	
		Rise of the Cybermen	**Lumic**
		The Idiot's Lantern	Magpie
		The Impossible Planet	**Base crew**
		Love & Monsters	
		Fear Her	
		Army of Ghosts	Hartman, Torchwood crew
		The Runaway Bride	
	07	Smith and Jones	Hospital staff
		The Shakespeare Code	Carrionites
		Gridlock	Hame
		Daleks in Manhattan	Cult of Skaro
		The Lazarus Experiment	**Lazarus**
		42	**Ship's crew**
		Human Nature	Redfern
		Blink	
		Utopia	Yana/Master, Chan-Tho, Docherty, Milligan
		Voyage of the Damned	Capricorn
	08	Partners in Crime	Foster
		The Fires of Pompeii	
		Planet of the Ood	Ryder
		The Sontaran Stratagem	Rattigan
		The Doctor's Daughter	
		The Unicorn and the Wasp	
		Silence in the Library	River Song
		Midnight	Dee Dee, Hobbes
		Turn Left	Magambo
		The Stolen Earth	Davros
		The Next Doctor	Jackson

Daleks, the problematic scientist was the creator of the cyborg race rather than a collaborator as such. In contrast, the scientist in *The Sontaran Stratagem* (2008) was a collaborator, but that story like *The Power of the Daleks* was resolved with a technological solution constructed by the Doctor.

One of the new series' stories was scientistic in its ideological closure, demystifying a Judeo-Christian-style creation myth on a warring planet and offering scientific enlightenment as the route to peace (*The Doctor's Daughter* (2008)). Another posited a techno-rationalist explanation for magic, reminiscent of the demystified gothic horror stories of the Tom Baker era (*The Shakespeare Code* (2007)). Three science-related stories fit the 'automated error' category in which an automated system causes inadvertent suffering just by doing its job, which is to provide medical care (*The Empty Child* (2005)), repair damaged equipment (*The Girl in the Fireplace* (2006)), or preserve the mental life of the terminally ill (*Silence in the Library* (2008)). Science ethics questions about 'animal' experimentation and 'playing god' with nature arose in *Dalek*, *New Earth* (2006), *Daleks in Manhattan* and *The Lazarus Experiment* (2007). Finally, *The Impossible Planet* and *42* (2007) both depicted crews of scientists doing dangerous and questionable work: in the former, a team of scientists risked life and limb to study a planet orbiting a black hole, an expedition which the Doctor was dubious about but also admired, and in the latter, a 'pirate' ship illegally scooped energy from a sentient sun, making the sun angry and putting the lives of the pirates in danger. There were no didactic messages about the importance of science for democracy in this era, which is consistent with the fact that neither new series Doctor explicitly identified himself as a scientist. Science issues explored in this era include pharmaceutical profiteering, genetic engineering, nuclear power, drug use, obesity and weight loss technologies, climate change, and deforestation and habitat loss.

In sum, the many changes that *Doctor Who* has seen over the decades stretch to its depiction of science, including its representation of scientist characters, its dominant ideological attitude to science, and its treatment of science-based issues and controversies. In the remaining chapters, I turn to core problems in science communication and examine the ways in which *Doctor Who* can speak to them.

CHAPTER 5 IMPERIALIST IMPOSITIONS AND DEMOCRATIC DEMANDS THE 'HERO SCIENTIST'

This first analytical chapter of the thesis addresses a core issue for the democratisation of science through fiction: the ideological function of the 'hero scientist'. If a hero's job is to save people, what is it they are being saved from? In the case of *Doctor Who*, how is the universe moulded to conform to the Doctor's ideologies? What must people do to earn his help? Which social functions of science are ideologically associated with democracy? And what is a hero's role when the people strive to institute democracy in social and scientific governance? The data for the chapter are the serials whose scenarios and plots explicitly involve contested relationships between democracy and science at a societal or community level, i.e. not at an individual or universal level.

The discussion is divided into three sections. In the first, I view *Doctor Who* through the lens of Hourihan's (1997) analysis of the hero's cultural significance in Western myth-making. Hourihan's work is a particularly appropriate choice here, in part because she includes *Doctor Who* in her analysis, but also because her target is specifically the political dynamics of the hero in childrens literature, rather than literary conventions in a broader sense. Hourihan contends that the literary device of the hero is intrinsically linked to the glorification of imperialism, including the imperialist imposition of Western scientific values on less powerful people. Imperialist commitments in *Doctor Who* have been discussed elsewhere (Caldwell, 1999; Charles, 2007; Tulloch and Alvarado, 1983), including by me (Orthia, in press-b)[34]. As outlined in Chapter 2, science's continuing role in Western imperialism is a critical issue to grapple with when discussing the democratisation of science. While I agree with Chapman's (2006) diagnosis of the Doctor's exhibited values of liberal tolerance (see Chapter 3), they are not as straightforwardly harmless as they may seem. The narrative demands of the hero construct ensure that liberalism has a sinister significance in a text like *Doctor Who* as a guise of intellectual imperialism. I expand and justify this assertion of the Doctor's scientific hegemony by looking at the serials dealing with colonialism or notions of civilisation.

[34] Full text in Appendix D. Parts of this chapter were reworked for that manuscript.

The second section provides something of a contrast through an analysis of serials that engage explicitly with questions of science and democracy but are not obvious references to real world imperialism. I investigate the extent of *Doctor Who*'s success in breaking from the ideological conventions of the hero construct and presenting more genuinely democratic possibilities for people's relationships to science.

The third section engages with Ruppersberg's (1990) concept of 'the alien messiah' to explain why some eras of *Doctor Who* are more democratically oriented than others. I show that messianism reinforces the undemocratic tendencies of the hero construct and by its nature must undermine the democratisation of science.

Science as imperialist imposition

The hero as imperialist device

Hourihan (1997) documents the widespread prevalence of the hero construct throughout Western literature. Her concept of the hero is different from that of Vogler (2007), who counterposes heroes against donors/mentors in terms of learning versus helping others to learn respectively. Hourihan uses the word 'hero' to refer to the men (not women) of action and adventure who face seemingly insurmountable external hurdles to achieve their goal. They are on a quest, their aim is to defeat the enemy and transform the outer world, rather than to tranform themselves internally. In this sense, those incarnations of the Doctor I classified as 'donor' in Chapter 4 (following Fiske, 1984) would fit Hourihan's definition of the hero.

Hourihan's examples range from Odysseus to Peter Rabbit, from Jack and the Beanstalk to Luke Skywalker. She traces the roots of the hero construct to imperialism and masculinity, claiming it functions to retell history as the victory of white, Western civilisation over the rest of the world and within that to mythologise the transition from boyhood to manhood. The hero story "always demonstrat[es] the 'natural' superiority of the Western patriarchy", a 'superiority' frequently rhetorically linked to Western science and reason since Aristotle and even more so since the Enlightenment (Hourihan, 1997, p. 21).

It is worth repeating verbatim the factors Hourihan identifies as common to this construct:

- The hero is white, male, British, American or European, and usually young. He may be accompanied by a single male companion or he may be the leader of a group of adventurers.
- He leaves the civilized order of home to venture into the wilderness in pursuit of his goal.
- The wilderness may be a forest, a fantasy land, another planet, Africa or some other non-European part of the world, the mean streets of London or New York, a tropical island, et cetera. It lacks the order and safety of home. Dangerous and magical things happen there.
- The hero encounters a series of difficulties and is threatened by dangerous opponents. These may include dragons or other fantastic creatures, wild animals, witches, giants, savages, pirates, criminals, spies, aliens.
- The hero overcomes these opponents because he is strong, brave, resourceful, rational and determined to succeed. He may receive assistance from wise and benevolent beings who recognize him for what he is.
- He achieves his goal which may be golden riches, a treasure with spiritual significance like the Holy Grail, the rescue of a virtuous (usually female) prisoner, or the destruction of the enemies which threaten the safety of home.
- He returns home, perhaps overcoming other threats on the way, and is gratefully welcomed.
- He is rewarded. Sometimes this reward is a virtuous and beautiful woman.

(Hourihan, 1997, pp. 9-10)

The Doctor meets these criteria well and comfortably embodies ‘the hero’. He has always been white and male, despite public campaigns in 2008 for the Eleventh Doctor to be black and/or female (The First Post, 2009; *The Telegraph*, 2008). Numerous commentators have discussed the essential Britishness of the Doctor as well as of *Doctor Who* generally (Butler, 2007b; Charles, 2007; Cull, 2001, 2005; Gregg, 2004),

and clearly he is the leader of a group of adventurers. His home planet Gallifrey — as an ancient, scientifically 'advanced' and almost technologically omnipotent society which chooses to hold its secrets close lest rogue forces use them for ill purposes — is the ultimate in 'civilised order'. This is the reason why he left — he was bored (*The War Games* (1969)) — but he remains loyal to Gallifreyan civilisation and all that it represents, even when it has been destroyed and he is the only Time Lord left (*The Fires of Pompeii* (2008)). The wilderness is the untamed universe which houses said rogue forces, and which always poses difficulties and dangers for the Doctor to overcome. The Doctor is certainly strong, brave, resourceful, rational and determined, and although he frequently claims to shun physical battle, violence has resolved *Doctor Who* plots in nearly a quarter of all serials. He is acknowledged as special by most people he meets including by his enemies. In each story he achieves his goal, which is usually the rescue of a virtuous prisoner (enslaved people, etc) or the defeat of enemies that threaten Earth, humanity or the universe. He does not, however, return home and receive his reward: in the new series, his inability to go home and his humility in never being thanked are brought to the fore as a part of his semi-tragic, lonely persona. Primarily this serves the demands of the *Doctor Who* formula, because as a continuing series it must repeat the same narrative arc with each serial, so infinitely postponing the return enables the cycle to start again. In another sense, his home is the TARDIS, and he does return to it at the end of each adventure, and his 'humble' reward is the reputation he has in fact wrought throughout the universe.

Northrop Frye's typology of hero stories is helpful for developing this (Frye, [1957] 1969). After Aristotle, Frye proposes five modes of story: myth, in which the hero character is a god superior in kind to humans; romance, in which the hero is an idealised human, superior in degree to other humans, and who dwells in "a world in which the ordinary laws of nature are slightly suspended" (33); high mimetic, in which the hero is superior to other humans but subject to the ordinary laws of nature; low mimetic, in which the hero is neither superior nor inferior to us, but rather is "one of us" (34); and ironic narrative, in which the hero's ability to act freely is inferior to that of the norm (e.g. children, animals, etc (Nikolajeva, 2001)). *Doctor Who* fits the romantic mode well, since the Doctor is superior to humans in his abilities and carries ambiguity about his ability to transgress the laws of nature, for example by being able to travel in time. The series also sometimes approaches the mode of 'myth', particularly in the new series

with its religious themes. The Doctor's periodic characterisation as more donor/mentor than hero itself indicates a god-like status.

This typology is also a useful measure for defining why the Doctor does not learn and grow. Nikolajeva (2001) notes that children's literature adventure stories in which the hero's trials are external and tangible rather than internal and emotional are most common in the romantic mode. It is in the mimetic modes that the hero's quest concerns a search for identity rather than a material change to the universe (Nikolajeva, 2001). Nikolajeva proposes Harry Potter as a romantic hero who is taken down to mimetic and ironic modes in his personal growth and struggles for identity, but who rises again to the romantic mode when climactic external circumstances demand it. Hourihan implies that the low mimetic and ironic modes offer liberatory possibilities when she states that the hero construct can be subverted by "adopting a narrative point of view which is not that of the patriarchal establishment" (Hourihan, 1997, p. 234). But the Doctor is often not that sort of hero: in 30 seasons of television, the moments when the Doctor learns, fails or apologises are relatively rare, and restricted to a subset of his incarnations. The significance of such moments is discussed in Chapter 7, but the conclusion to draw from these general trends is that the Doctor is primarily a hero of the romantic variety.

A crucial component of a hero tale noted by Hourihan is that it is *the hero's story*: it is about him, and it is told as if from his perspective, with other characters only relevant insofar as they are important to the hero. This point is critical for differentiating those incarnations of the Doctor who best fit the classic hero mode from the incarnations who break with it somewhat. Where other characters, such as companions, are foregrounded, notably in the Doctor eras of Hartnell, Troughton, Davison and McCoy, the hero 'spell' of the Doctor is to some extent broken. Obvious parallels may be made with expertise issues in science communication: moves to democratise expertise in ways appropriate to PAS demand a shift in focus away from the champion science expert in order to confer expert status and/or governance power on non-scientists and non-experts. Again, these matters are the focus of Chapter 7.

Hourihan points out that Western hero narratives counterpose the hero's qualities in dualistic dichotomy to the "inferiorized other" which it is the hero's aim to conquer, defeat, understand, reform or tame (Hourihan, 1997, p. 16). The 'others' are defined only by unfavourable comparison with the hero, not on their own terms. This formula is

used routinely in *Doctor Who*, with baddies or characters of dubious morals always compared to the ideal presented by the Doctor, and ultimately either transformed to be more like him or punished for their failure to choose transformation. The nature of the duality does shift, with the Doctor sometimes representing rational secularism against ignorant superstition, sometimes Romantic humanism against technocratic utilitarianism, other times simple compassion and technical skill against cruel people in a watered down version of both these ideals. Always though there is something wrong with the 'other', some deficit that needs to be addressed.

Hourihan states that "[Western] Imperialism can only be justified if it is seen as bestowing a superior way of life upon the conquered peoples; that is, it depends upon a belief in the superiority of Western culture and the altruism of the conquerors" (Hourihan, 1997, p. 28). This is certainly true in *Doctor Who*: like his much-maligned counterparts on *Star Trek*'s Starship Enterprise (Bernardi, 1998), the Doctor is the friendly face of imperialism. True, he is not a galactic naval fleet like them and does not usually represent any official institutional interests, though there are exceptions to this too, including his invocation of intergalactic law ("the Shadow Proclamation") in the new series. He does 'save' people from their own 'ignorance', though, by correcting their mystical beliefs (*The Curse of Peladon* (1972), *Death to the Daleks* (1974), *The Brain of Morbius* (1976), *Planet of Fire* (1984), *The Doctor's Daughter* (2008)) or maligning their attempts to survive in the face of 'inevitable' death (*The Tenth Planet* (1966), *Rise of the Cybermen* (2006), *The Lazarus Experiment* (2007)). Regardless of the values that anybody else might hold dear, his morality is (almost) always shown to be correct, his reason to be ultimately flawless, and his motives to be spotlessly altruistic. The recursive reasoning is that altruism is defined as good, while good is defined by cultural prejudices, and thus imperialism is justified by itself.

In dealing with *Doctor Who* explicitly, Hourihan finds the program reproduces centuries old tales about "the white hero's subjugation and salvation of the savages" (Hourihan, 1997, p. 140) in "endlessly repeat[ing] the confrontation between the Doctor, the rational, humane and rather dandyish embodiment of all the best qualities of Western culture, and one or another tribe of evil opponents" (141). She discusses the novelisation of the Cybermen story, *The Moonbase* (1967):

> The closure, which is repeated with minor variations in every adventure in the series, demonstrates that the Doctor and his friends are rationally as well as morally superior to the cybermen, despite the latter's computerized brains. If eighteenth- and nineteenth-century hero tales inscribed the superiority of Europeans to all other races on the planet, *Doctor Who* reassures its readers and viewers that they are the moral and rational lords of the universe. (Hourihan, 1997, p. 142)

I agree with Hourihan's diagnosis. To bring her point home and to show that in *Doctor Who* the hero does serve these sinister masters in the name of science, in the rest of this section I illustrate the imperialist tendencies in *Doctor Who*, and show how they are intrinsically linked to science. First, I review the serials that engage explicitly with colonialist scenarios. I show that in all cases, the colonised people must prove that they 'deserve' self-determination and freedom from colonial rule, and that they do this by embracing Western-style rationalist, atheist and scientific worldviews. Following that, I discuss the program's use of the concept 'civilisation', focusing particularly on 1960s and '70s serials because of their active negotiation of the concept. While after the '70s, explicit discussion of what constitutes civilisation all but disappears and is sometimes challenged, I argue that the same underlying discourses are detectable in the series right up until 2008. The program's notion of 'civilisation' implies the Western-style rationalist, atheist and scientific worldviews found in the colonialism scenarios, and this is bound up with Western individualist models of personhood and Western models of what constitutes ethical behaviour. Characters must earn the Doctor's respect and loyalty by proving that they are civilised in these multiple ways. Needless to say, this imposition of Western values on people is antithetical to the democratisation of science.

Proving oneself worthy: stories of colonialism and science

To state up front that *Doctor Who* is pro-colonialism would be misleading: at the most obvious level of interpretation, the program stands unequivocally opposed to colonialism. *Doctor Who* has dealt with anti-colonialist scenarios reasonably frequently throughout its history, starting in its first season and continuing in the new series. The most obvious engagement with these themes is in eight serials featuring colonial situations in crisis. Two of these (*The Sensorites* (1964) and *Kinda* (1982)) take place at

the moment when colonialism threatens, and both are resolved with human (or human-like) proto-colonisers quietly agreeing to leave, never to return. The other six deal with long-standing colonial situations, and are resolved via an indigenous uprising. In four (*The Space Museum* (1965), *The Mutants* (1972), *The Power of Kroll* (1978-9), *Planet of the Ood* (2008)), the uprising forces the colonisers off the planet, and coloniser and colonised are shown to be incompatible cohabitants. Two (*The Savages* (1966) and *The Happiness Patrol* (1988)) conclude differently, with colonisers and colonised reconciling after some members of the coloniser society demonstrate solidarity with the oppressed indigenous people, but only after the oppressive former regime has been toppled and its key instruments of oppression destroyed.

Three serials have taken a subtly contrary position to these anti-colonialist tales, however. *The Aztecs* (1964), *Colony in Space* (1971) and *The Curse of Peladon* all implicitly justify colonialism on the grounds that the colonised are 'savages' in need of 'civilisation'; a justification that has been used to justify imperialism and colonialism in the real world (Buchan and Heath, 2006; Said, 1978). In *The Aztecs*, set just prior to Cortes's conquest, historian companion Barbara tries to save the people from their "barbarous" selves by preventing the practice of human sacrifices. She does this in the belief that by cultivating the "civilised" side of Aztec culture, she can alter the Conquistadors' negative perception of the Aztecs and thus prevent the conquest from ever occurring. Barbara gives up when the Aztecs fail to rise to her challenge, surrendering to the inevitability of the fate that the Aztecs appear to bring on themselves. Similarly, *The Curse of Peladon* concerns a 'medieval' world governed by religion. Its rational, atheist king fights against the dominance of religious orthodoxy by inviting an interstellar, UN-like Federation to intellectually colonise his planet, in order to raise his people from the "barbarism" of superstition and ignorance. The Federation are only too happy to oblige. *Colony in Space* concerns three parties: a tribe of indigenous "Primitives", a small community of alternative lifestyle colonisers seeking refuge from an overpopulated Earth, and the Interplanetary Mining Corporation come to plunder the planet of its minerals. The Primitives (as they are called) are the mute, brown- and green-skinned descendants of a once great but foolish civilisation which declined under destructive and poisonous technologisation; they have lost their science and replaced it with religion. The story is resolved by the self-sacrifice of the Primitives at the behest of their voiced, white-skinned leader, who considers his people doomed because of their failure to make enlightened choices years before. The concurrent

bringing to justice of the evil mining corporation leaves the planet conveniently empty for colonisation by the Earthlings.

Common to all these serials is a judgement about the worthiness of the colonised to self-govern, and evidence of worthiness often comes in the form of conformity to Western-style 'scientific enlightenment'. Thus, the indigenous Sensorites are shown to be scientifically competent, with their own laboratories and experimental scientists (*The Sensorites*). The colonised Xerons — even while they joyfully dismantle the science museum that is the masters' primary tool of oppression, the masters having defended science as "intelligent and inquiring", with "no tricks", "only facts" — agree to the Doctor's injunction not to "lose sight of science altogether" (*The Space Museum*). The oppressed "Savages" reveal that they too had science before the oppressive "Elders" started sapping their life force and took away everything but their religion (*The Savages*). In *The Mutants*, an off-world anthropologist finds evidence of the indigenous Mutts' sophisticated scientific knowledge, now lost due to colonisation. The grass-skirt-wearing indigenous Kinda have necklaces resembling the DNA double helix, and have the ability to engineer complex audio-psychological technology, causing the Doctor to admire them as "very sophisticated people" (*Kinda*). The Peladonians are willing to become scientific instead of superstitious (*The Curse of Peladon*), so Peladon retains a large degree of autonomy even while voluntarily remaining under the intellectual mentorship of the Federation. On the other hand, both the Aztecs and the *Colony in Space* Primitives fail when offered the opportunity to follow a Western rationalist path, instead reverting to superstitious beliefs; thus they prove their unworthiness even to exist let alone self-govern. In all cases, the worthy embrace Western-style science, and reject religion or trivialise its significance.

As discussed in Chapter 2, when, in the real world, Westerners have passed judgement on the value of indigenous knowledges, it has been common practice to praise them for their compatibilities with Western science but to reject the elements that are incompatible, such as religious beliefs. This is fundamentally both scientistic and racist, and reinforces Western science's material and rhetorical power (Green, 2008; Simpson, 2004). Further, it calls to mind the ideological viewpoint commonly known as *terra nullius*, which considers the exploitation of nature to be intrinsic to the state of being human (Fitzmaurice, 2007), and so dismisses the property rights and polities of those people whose nature-exploiting activities do not conform to Western standards (Buchan

and Heath, 2006). Accordingly, the rejection of *terra nullius* has been rhetorically important in legal battles for indigenous land justice.[35] By conferring self-determination only on those with the 'correct' attitude to rationalist science and technology, *Doctor Who* implicitly justifies *terra nullius*-influenced dispossession.

The Power of Kroll, *The Happiness Patrol* and *Planet of the Ood* are exceptions to this pattern to some extent. None of the colonised races in these serials visibly possess Western-style science and technology, yet their entitlement to self-determination is more or less endorsed by the Doctor, and hence, by the program's authors. There are caveats to this though. The indigenous "Pipe People" in *The Happiness Patrol* are not the focus of their story, rather the focus is on working class members of the coloniser citizenry, and these colonisers remain on the planet, so it is unclear if the Pipe People have won genuine self-determination. The colonised "Swampies" in *The Power of Kroll* reveal that they have *chosen* to inhabit their planet and live their 'simple' life — they did not end up there through chance and indigeneity — implying that their non-technologised lifestyle is not a deficit borne of 'ignorance' but rather a decision based on 'enlightened reason': they are 'Westerners' going back to nature.

The Ood, the most recently depicted colonised subjects, are indigenous, do not visibly possess their own science, and win self-determination through an uprising, so at first glance seem to be exceptional, but again there are caveats to this diagnosis. The Doctor remarks that the Ood's planet is near to the Sensorites' planet and that the two species are likely related, perhaps suggesting that the Ood are closer to rationalist technologisation than they appear. The Ood ultimately prove their worthiness to self-govern another way: by offering religious-style tribute to the Doctor and companion Donna. The Doctor and Donna — human-like and human — resemble the colonisers (who are human) and do little but stand in solidarity with the Ood. Yet the Ood almost worship them. The Doctor obnoxiously asks for the privilege of pulling the switch that effects the Ood's liberation and his wish is granted, thus depriving the colonised of their own symbolic moment. At the end of the serial, the Doctor and Donna are given a glorious send-off with their very own hymn-like Ood song, and as they climb, Christ-like, into the TARDIS for literal ascension into the heavens, they are told their input will never be forgotten. By directing their religious energy in a rationalist direction,

[35] Although the principle of *terra nullius* remains relevant, the term's etymology is widely misunderstood, so its use including in legal cases has frequently been anachronistic (Fitzmaurice, 2007).

towards the scientifically minded Doctor — and by offering appropriate gratitude towards the benevolent bearers of the 'white man's burden' — the Ood prove themselves worthy too.

The discourses of race implicit in these serials are very complex, and this thesis is not the place to tease them apart. Suffice it to say that the judgement of a people's worthiness is based on similarity to Western society (good) or difference from it (bad), with scientific capacity and rational secularism a critical measuring stick of this. This way of looking at it is somewhat reductionist though, because it carves off scientific capacity from other human qualities. In reality, the discourses that underlie this cultural judgement are far more complex and intrisically linked to the notion of 'civilisation'. This is discussed next.

The logic of self interest; the ethics of civilisation

The 1960s serials' fascination with artificial intelligence in the form of super-computers, cyber technology and genetically engineered people raised questions about the nature of 'civilisation', and what it means to be a 'civilised' human being. Numerous times, the program explored the potential consequences of machines being granted decision-making power over human (or human-like) societies. In season 1's *The Keys of Marinus* (1964), which features the powerful "conscience machine" that has kept society harmonious through mind control, the Doctor makes the humanist point that "machines can make laws but they cannot preserve justice. Only human beings can do that."

A recurring theme in the '60s serials that helps explain this proposition is the idea that logic-based artificial intelligences are inherently, indeed logically, self-interested. In *The War Machines* (1966), the computer WOTAN "is merely a brain which thinks logically without any political or private ends. It is pure thought. It makes calculations. It supplies only the truth." This 'pure logic' leads WOTAN to conclude that machines are the next stage of evolution so humans must be eliminated. Similarly, the computer in *The Ice Warriors* (1967) becomes dangerous because it puts self preservation first, and is thus unable to give advice to the humans on the best action to take, since both 'best' action options could result in the computer's destruction. In *The Tenth Planet*

(1966), the pure logic of the Cybermen — whose emotions have been deliberately removed — results in a logical absence of concern for their fellows. This idea had already emerged in *Galaxy 4* (1965), with the genetically engineered Drahvins scoffing at the TARDIS crew for caring about and helping each other and especially for being willing to die for each other.

Why computers and 'artificial' people should be *morally self serving* rather than *morally neutral* is an interesting question. Miller (1999) notes that self interest has been considered the "cardinal human motive" in the West since Hobbes' *Leviathan* in the 17th century. Neo-Darwinists, exemplified by Richard Dawkins, and as far back as Herbert Spencer, have applied the concept to biological systems to explain the process of evolution, enshrining a cultural norm as biological reality. If 'survival of the fittest' is the rule of nature, then it is no wonder that new born species (the computers, the Cybermen, the Drahvins) subscribe to it. This is further reinforced in *An Unearthly Child* (1963), in which the 'primitive' prehistoric tribespeople lack the capacity for compassion. Tribe member Hur gets confused and jealous when Susan tries to help the injured Za, because as Ian notes, Hur doesn't understand kindness and friendship.

The question then is where do we acquire a capacity for altruistic action and compassionate reason, if not from nature?

Building on *An Unearthly Child*, the most obvious answer is 'civilisation'. In the Aztecs, it is precisely the "highly civilised", "good" side of Aztec "nature" that is counterposed to the "evil" side that is fond of human sacrifices. Inherent in the evil side is superstition, and inherent in the good side is rationality. Civilisation, then, entails both rational action and ethically good action. Barbara believed the Aztecs were civilised enough to overcome their 'savage' nature and become 'good', but was ultimately proved naïve in this belief. The ideological closure of this story rests on the wrongness of trying to change history, and the Doctor spends the whole serial trying to stop Barbara's well meaning efforts. Ultimately, *The Aztecs* sells viewers a stagist view of history in which the people were inherently doomed to destruction by their lack of moral 'fitness', which went hand-in-hand with an inability to throw off the chains of superstition and embrace rationality. It is an application of the Hegelian linear notion of "phases", a necessary series of steps humans must pass through to grow from "sense-consciousness" to "science philosophy" (Hegel, [1807] 1977). Hegel intended his

treatise to reveal how science may be made "open and accessible to everyone" (§13), and *Doctor Who* applies this as a judgement on those who have not passed through the requisite stages, as proof of the superiority of Europe and the West.

This stagism — ubiquitous in the discourse of 'primitive' and 'advanced' technology throughout the series — reappears in *The Time Meddler* (1965). The Doctor makes it his mission to stop his fellow Time Lord, the Meddling Monk, from speeding up human (Western European) technological progress from the year 1066 onward. The Monk merely wants to see jet aeroplanes in the 13th century and allow Shakespeare to watch his own plays on telly. To the Doctor this is fundamentally wrong, suggesting again that history happened the way it did according to a natural trajectory, and 'primitive' people are not allowed to have 'advanced' knowledge until they are properly civilised. In *The Time Warrior* (1973-4), set in the 13th century, the linear trajectory of humanity's evolving civilisation is made clear in the Doctor's pleas to meddling alien Linx, who manufactures weapons for a human warrior:

> Human beings must be allowed to develop at their own pace. In this period, they're just a few steps away from barbarism. [...] You give them breach loading guns now, they'll have atomic weapons by the 17th century. They'll have the capability to destroy their own planet before they're civilised enough to handle it.

Proving the point, the Minyons (*Underworld* (1978)) were given science by the Time Lords before the Time Lords knew better. The Minyons were not civilised enough for it, as evidenced by their non-rational belief that the Time Lords were gods, and accordingly, they blew up their own planet with atomic weapons.

In the form of metaphor, *The Ark* (1966) tells a similar tale. The 'primitive' and speechless (and brown-skinned) Monoids usurp the (white) human leadership onboard a spaceship that carries the last members of both species. Disaster ensues, with the Monoids' thug tendencies emerging in mindless violence, the implication being that the Monoids were not yet sufficiently morally evolved to rule. The society they create is a grotesque parody of human civilisation: punitive and small-minded, selfish and vengeful. The Monoids parasitise Earth technology including the 'voice boxes' made for them by the benevolent humans, still living in the shadow of their past as 'secondary

citizens' and fighting amongst themselves. These people were obviously not ready for self-determination. This story is a nasty affront to anti-colonialist struggles, because it suggests in no uncertain terms that there is a fixed path of cultural development that, with time, culminates in both scientific accomplishment and moral responsibility: civilisation. Those who are not yet far enough along on either path must wait longer to achieve independence.

A stagist view of history is further reinforced in *Death to the Daleks* when it is explained that the pyramids of Peru were built by powerful aliens who had "solved the mysteries of science". This explanation avoids inconvenient Incan disruptions to the Western Enlightenment mythologised timeline of human history, which states that humans went from 'prehistoric primitivism' to 'medieval barbarism' to 'enlightened civilisation'. Other planets apparently follow this same stagist program of development: the Doctor warns that Chloris (*The Creature from the Pit* (1979)) will be "hurled back into the dark ages" if the people are not allowed to trade metal so that they can "plow the land" to "master the forests and the weeds", again recalling *terra nullius* notions of what it means to be fully human. *The Curse of Peladon* (and its sequel *The Monster of Peladon* (1974)) is packed with the language of stagist developmentalism: Peladon is a "primitive" planet, the Federation has come "to raise [it] from barbarism", the King wants "to raise ourselves from the dark ages", and the Doctor praises him as "a civilised king" and "an enlightened ruler". When religious leader Hepesh fears that the Federation will "exploit us for our minerals", "enslave us with their machines" and "corrupt us with their technology", the Doctor speaks up for the Federation, linking progress and enlightenment in scientistic preaching:

> Doctor: The progress that they offer - that we offer - isn't like that.
> Hepesh: I would rather be a cave dweller and free.
> Doctor: Free? With your people imprisoned by ritual and superstition?

The concept of civilisation also entails class snobbery. In *The Time Warrior*, comparisons are made between the coarse, violence-loving, regional-accented, Anglo-Saxon warrior Irongron, and the genteel, peace-loving, RP-accented Normans Sir Edward and Lady Eleanor who live in the neighbouring castle. Civilisation in this story is mapped onto twin axes of implied social class and human evolution, as if Irongron is a more 'primitive' form of life by both criteria. When the Doctor escapes from Irongron

to the safety of Sir Edward's castle, he states "it is a pleasure and a privilege to be in the company of civilised people at last". Irongron's position in the social and evolutionary hierarchy is clear from the Doctor's conversation with genteel 20th century physicist Rubeish:

> Rubeish: Who is Irongron? He a nice chap?
> Doctor: Well I wouldn't recommend him for the Royal Society.

'Civilisation', then, can pack multiple meanings.

The application of the word is contested in the program to some extent. In some instances in the '60s, it merely means technologically advanced (in *The Daleks* (1963-4), *The Savages*, *The Ice Warriors*, *The Dominators* (1968) and *The War Games*). In each case there is a degree of irony about it, because each so-called civilised society is found to be morally dubious or shallow, and a little intellectually short-sighted; it is not *fully* civilised.[36] Here the Romantic element of the program looms, because the advances of science and technology are just not enough, and an irrational element — a 'human factor', linking the concept of civilisation to ethical standards — is needed to correct the societal shortcomings. In *The Savages* the human factor is the surrender of the oppressors' scientific accomplishment for the sake of peaceful coexistence. In *The Ice Warriors*, the human factor is the creativity of a genuinely free intellect, embodied by the individualist scientist Penley, to cut against the fixed logic of the computer. In *The War Games*, the human factor is the drive to apply scientific knowledge to benefit people rather than simply gathering information: that the Time Lords lack this drive is the reason the Doctor left their society.

So then the question still stands: where does the capacity for altruism and benevolence come from? Crucially to this thesis: what makes scientist Penley a fundamentally different creature from the self-serving computer in the same story? The answer lies in

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[36] The stagist ideology is emphasised through a cultural reversal in *The Mind of Evil* (1971), in which the Doctor converses in fluent Chinese (Hokkien, he says) with Chinese ambassador to the UK, Fu Peng. Fu Peng remarks how delighted he is to meet a charming person (the Doctor) in this "barbaric" country (the UK). This remark is enjoyable to the viewer who seeks an alternative to the barrage of Eurocentric elitism presented by *Doctor Who*, however it is not of consequence to the plot, and rather than undermining the dominant ideology of Eurocentric stagism, it functions more as (a) a marker of the Doctor's cosmopolitan outlook compared to the Brigadier's sheltered parochialism, and (b) a joke which depends for its humour on an audience assumption of the decidely non-barbaric nature of the UK. I discuss some problems with *Doctor Who*'s cosmopolitan vision in the manuscript that builds on this chapter (Appendix D, Orthia, in press-b), agreeing with Bowden (2009) that cosmopolitanism can be imperialism in another guise.

the liberal ideologies that historically accompanied the Enlightenment's scientific and technological progress.

Penley is a pin-up boy for individualism. He despises the "ant-heap" society built on computer logic and his conformist colleagues who rely on computers and cannot think for themselves. The Doctor agrees with him. When Penley's conformist boss Clent complains about Penley being temperamental, the Doctor defends him: "Creative scientists have to be allowed some head you know." Later, he insists to Clent, "Your regulations do not apply to me. I work in my own way, freely." Short-lived character Walters, frustrated with the computer's inability to give advice, exclaims:

> Walters: What we need, is, is someone like, like Penley, or that Doctor! Someone who can think! Not with a machine! And what good's your precious computer done anyway? Nothing! Nothing but trouble! And it's time somebody put a stop to it!

Moments later, he is tragically dead when he tries to smash the computer and computer technician Garrett shoots him. Walters is portrayed as an Enlightenment hero, striking a blow for the Kantian ethical subject whose independent reason sees moral truth clearly and whose freedom from social conventions allows him to act on that truth (Kant, 1784; Meyers, 2004). In this story, science is co-opted into serving an ideological commitment to Western Enlightenment individualism.

Or perhaps it is the other way around. Fiske (1984) argues that individualism is a high point of cultural consensus to which low consensus issues are hitched to help them 'sell'. The writer of *The Ice Warriors*, Brian Hayles, used individualism to sell his audience a particular brand of science that is creative, brilliant, and untethered to mindless technologism. Hayles' version of the Hero Scientist is flexible enough to know what might work, not just what the latest fad is. This becomes clear in Hayles' sequel, *The Seeds of Death* (1969), in which new technology 'T-mat' (a form of matter transmission) fails when aliens attempt to invade Earth, plunging human civilisation into chaos. It takes a clunky, old-fashioned rocket to solve the problem, and an old-school individualist scientist Eldred, who runs the space museum full of superceded technology, to commission the rocket because nobody else knows how.

Hayles' answer to the question about the source of altruism *is* civilisation after all; it is just a slightly different concept of civilisation from the one he criticises. Civilisation is not merely the inevitable product of stagist progress, it is an ideological adoption of Kantian reason leading to the inevitable rational discovery of objective ethics: it is Enlightenment. Reason wielded by a free individual represents a fundamentally different ethic than logic wielded by a conditioned, artificial consciousness. Only the free, reasoning subject can finally accomplish mastery over nature, including over their own 'barbaric' selves to emerge from the 'state of nature'. The same philosophy emerges elsewhere in '60s *Who*: for example, in *The Dominators*, when Zoe's independent and scientifically inquiring mind is instrumental in her resistance to enslavement, in contrast to the susceptible, stupid Dulcians who do not apply scientific rigour to their research and are easily enslaved.

These highly didactic stories require a particular model of personhood and particular cultural constraints before they will credit scientific intelligence. Beings who are dividual (e.g. the Drahvins and the Cybermen) or dependent (e.g. Clent and Garrett) are *by definition* unable to think for themselves independently of societal constraints, so their intelligence is supremely limited. Peculiarly, artificially conditioned beings such as WOTAN and Garrett's computer are also unable to think freely because of their social conditioning (programming), and therefore their 'pure logic', rather than being overly objective and neutral, is actually *subjective* by Kantian ethical standards, being self interested and thus blind to the great moral truth. This desire to reject dividuality, dependence and social conditioning is itself a cultural norm: one indicative of Western, masculinist elitism and a belief in fixed universal truths. No situated knowledges or subaltern standpoints; the enslaved are merely ignorant. Access to truly inquiring science is then dependent on a commitment to very specific cultural values, in the guise of liberalism and liberation.

Few characters in these stories have enough backbone to stand up to this rigorous cultural test. Even scientists' minds are taken over by WOTAN. So-called leaders fail to defeat the Cybermen because they are too much like Cybermen themselves. The Elders (in *The Savages*) only discover ethics once they have absorbed the Doctor's mental essence. It is a rare person who can be hero in these stories. The close discursive relationship between these narrow concepts of ethical capacity and the permission to do

science ultimately makes science unavailable to the many — even the scientifically literate — and reserves it for the few.

These notions, particularly the 'good' of progress, were challenged in a few '70s serials, for example in stories railing against mining and environmental pollution (*Colony in Space*, *The Mutants*, *The Green Death* (1973), *Invasion of the Dinosaurs* (1974), *Robot* (1974-5), *The Power of Kroll*), though several of these contain the problematic depictions of the colonised discussed above. Notions of the 'good' of Western 'civilisation' were more profoundly challenged by the Davison-era story *Kinda*, which teased apart scientific enlightenment, technological progress, and Western teleologies of societal evolution. While, as noted, the Kinda do prove themselves scientifically knowledgeable, they reject Western individualism, Western linear models of time and the Western fetishisation of technology. In *Kinda*, 'primitives', 'idiots', women and children all sit in innocent, timeless opposition to the darkness of masculinist Western civilisation, which begins with killing, rises and falls, is timed with history, and is associated with the insanity and fear that arise from dreaming alone.

Normative discourses of 'civilisation' are largely absent from '80s *Doctor Who* with the exception of Davison's penultimate story, *Planet of Fire*, which reproduces the Enlightenment myth, counterposing an oppressive society built on mystical religion and cruel human sacrifice to its more civilised potential future that "will soon advance" under atheist leadership. These ideas reappear in the new series in *The Doctor's Daughter*, another Enlightenment myth in which rational atheism is needed to stop a war, and in which people who reject their religious beliefs literally come out of the darkness and into the light of science, ethics and pacifism. In *The Long Game* (2005), *Tooth and Claw* (2006), *The Fires of Pompeii* and *The Sontaran Strategem* (2008), the Doctor states that there is a fixed version of history and a fixed sequence of technological development which must not be interfered with. Finally, in *Planet of the Ood*, the series comes full circle in its characterisation of civilisation. A key debate about the enslavement of the Ood concerns the question of whether the Ood are animals or people. The slavers, naturally, argue that they are animals, while Donna argues that they are people. Her evidence is the biologically curious fact that the Ood carry their brains in their hands. This vulnerability suggests to Donna that the Ood would have to trust anyone they met, or risk death. It is this quality of trust that Donna identifies with the state of being human. In other words, the Ood have transcended the instinctive, neo-

Darwinian self interest that characterises the uncivilised — such as the stone age people who do not understand friendship in *An Unearthly Child* — and become fully human. Thus, even serials that strive to embrace liberatory polities are underlain by the same Enlightenment discourses that have been used to oppress.

The final point to be made here speaks to Hourihan's thesis that the Doctor's enemies metaphorically reference the real world non-white colonised subjects of European imperialism. The 'uncivilised' and therefore undeserving enemies are frequently depicted as darker-skinned, unable to speak or unable to speak English, marked by a 'tribal' aesthetic, and/or participate in ritualistic behaviours and ceremonies, all of which mark them as non-European. In the new series such enemies include the 'tribal', bone-decorated slavers the Sycorax (*The Christmas Invasion* (2005)), who believe in witchcraft despite their interplanetary technology, and the animal-like, violent, pierced Futurekind (*Utopia* (2007)). Notable examples from the original series include the Mutts (*The Mutants*), whose civilisation is proved when their 'faulty' evolution into black, ugly, animistic creatures of instinct is 'corrected', allowing them to evolve into white, light-filled, angelic beings of rational intelligence; and the Exxilons (*Death to the Daleks*), whose superstitious, human-sacrificing, chanting variants are dark-skinned and speak no English, compared to the rationalist minority who are silvery white and speak English articulately and with an RP accent.

In this section I have shown that the Doctor meets Hourihan's definition of the literary hero, which she argues serves the cultural function of celebrating the Western imperialist conquest of the world. I have shown that *Doctor Who*'s engagement with the concepts of colonialism and civilisation indeed reflects Western Enlightenment values that by and large judge a people's worth by the extent to which they embrace Western-style science and a Western individualist model of personhood. I have finished by showing that auxilliary elements of characterisation such as characters' physical appearance often reinforce the imperialist myth-making that Hourihan argues is present in *Doctor Who*. In essence, these serials show that the hero scientist serves Western imperialism in the guise of altruistically bringing reasoning science and rational democracy to the universe.

Hourihan's view (and mine) contrasts with that of the science students interviewed by Tulloch (Tulloch and Jenkins, 1995, p. 60) who enjoyed "the ideological dominance of

technological rationalism" and the sense of the Doctor "as a modern-day knight bringing the 'new principles of physics and mechanics' to the post-medieval world". But is that — whether loved or hated by fans and scholars — the only way in which the hero scientist can function in a fictional text? Since *Doctor Who*'s ideals have changed throughout its history, is it then possible that it also presents audiences with liberatory models of the democratisation of science in oppressed societies? Or is the hero construct incompatible with a democratic vision of society in which people may choose their beliefs? That is the topic of the next section.

Science as democratic demand

Democratic science governance

It is easy to find problems with an imperialist approach to science, but what would democratic governance of science look like in a Western-style society? This point has been much debated by science communication scholars, and in 2002, Harry Collins and Robert Evans declared the need for a 'third wave' of science studies to speak to it. In their typology, this wave comes third after a non-reflexive 'first' wave which assumed a technocratic approach to science governance, and the sociological turn establishing a second wave which challenged normative power relations between science and publics (Collins and Evans, 2002). Collins and Evans stated that while the second wave dealt manifestly with what they call 'the Problem of Legitimacy' in science governance by establishing that scientists are not the only legitimate experts to call on for technical problem solving, it did not adequately address 'the Problem of Extension': questions of how far science-related decision-making power should be extended beyond technical experts. In other words, they were concerned that the second wave's model of governance risked granting too much power to non-specialists, including lay people, who were likely to make poor decisions. To address this, they distinguished two kinds of expertise — technical expertise, which is held by core specialists of scientific or non-scientific varieties, and political expertise, which essentially refers to community franchise in decision making — and recommended finding balance between the two to effect appropriate science governance. Balance in this case means instituting dialogue with affected publics on scientific developments but heeding technical experts' advice too.

The paper was not universally well received. Sheila Jasanoff (2003) criticised it on a number of grounds including that processes of legitimating expertise are inherently political and historical rather than objective and neutral, so identifying *a priori* who the 'technical experts' are is inherently fraught. Wynne (2003), too, raised numerous objections, including that the paper trivialised non-scientific interventions such as that made by the Cumbrian sheep farmers in his classic study (Wynne, 1992a), by reducing them to the status of mere technical knowledge, rather than more accurately depicting them as completely different worldviews from the normative scientific one and profoundly challenging to its dominance. Both Jasanoff and Wynne disagreed with Collins and Evans' division of expertise into the technical and the political for these reasons. Wynne noted that a less tokenistic democratic model would enable people to frame critiques and questions about science themselves, not merely give their answers to propositions about science issues asked by technical experts after it has already been framed within the narrow terms of technical risk. As he clarified in a later paper (Wynne, 2008), what are commonly seen to be *science issues* are in fact *public issues*. Emphasising the *technical risk* of an issue as Collins and Evans and others do — circumscribing particular problems as science issues and so separating them from other problems that are seen to be more purely political — reinforces the scientism that promotes science's authority and expertise (Wynne, 2008).

The question for Jasanoff and Wynne, then, is not one of balance between technical knowledge and franchise, but one of how society is to be run and the role — if any — that science will play in it. Once more this recalls the PUS-PAS distinction and the question of whether public dialogue's function is to facilitate public governance over science or to find more 'inclusive' methods to legitimate the ideology of progress that science is already committed to (Irwin, 2006). Public participation models of governance have become politically desirable if political rhetoric is anything to go by (Irwin, 2006), but this does not mean that facilitating democracy is necessarily the first thing on everyone's mind. Rhetorics of inclusive expertise and democratic governance frequently merely signify strategic political moves that have no significant impact on practice or outcomes (Weiner, 2009). Irwin's case study of the 2003 UK *GM Nation?* public dialogue on genetically modified crops showed that while publics expressed consistent objections to GM technology, these were ultimately dismissed and ignored in policy making. Talk has its value, Irwin notes, but *GM Nation?* "was not intended by its

organizers to be an exercise in mass therapy" (Irwin, 2006, p. 314), so in effect this particular event was tokenistic at best.

Little scholarship has looked at representations of science governance in fiction. This is not to say there is no scholarship on fiction protesting against science: there is much of this, particularly discussing the cultural significance of scientist villains as an embodiment of science-based risk, and I discuss this in Chapter 6. The two ideological tendencies the Doctor embodies in opposition to scientist villains — noble scientist or Romantic humanist — each represent a different kind of response to this risk. If the Doctor defeats scientist villains' plans through science, in a sense this equates to a 'third wave' technical expert solution (Collins and Evans, 2002) because the problem is set up as a propositional one: 'here is a scientific development, what is your expert response to it?' There may also be political expertise involved, with affected people objecting to the development, but ultimately good science defeats bad science in a victory for technorationalism. When the Doctor wears his Romantic humanist hat, he participates in a different grand narrative that challenges science at its very foundations (Toumey, 1996). Such serials are important expressions of public antiscience sentiment which frame the issues in a radically democratic way, shifting the debate away from a frame of technical risk, but they may skim over more nuanced complexities of public feeling towards science that are important for questions of science governance. For example, Wynne's early sociological studies, including the Cumbrian sheep farmer study (1992a) and interviews with other people dwelling near or working at the UK's Sellafield nuclear facility (1992b), showed that people's attitudes towards science were ambivalent more than wholly critical, partly because many locals were economically dependent on Sellafield. Framing the issues can entail more than an idealistic Romantic or generic revolutionary critique: it means negotiating the appropriate role for science in a society that is thick with mundane, less than ideal, but critically significant material realities.

Research by Jones (2001) is exceptional in depicting this kind of public dissent to science in post-war British films. Much of the dissent he documents resembles standard critiques of scientist villains such as arrogance, an uncaring attitude or science's potential for great destruction. He also documents other objections to scientific developments though, such as those raised in the 1951 film *The Man in the White Suit*, which depicts textile workers and a washerwoman protesting against a scientist's

invention of an indestructible fibre (Jones, 2001). It is this kind of tale that I seek in this section: stories demonstrating dissent not to the founding premises of science, but to the way that science is managed politically and economically in terms of accessibility, ownership and control. To what extent is it possible to depict science as a democratic and public good in a television show that revolves around a hero scientist, *without* the hero scientist imposing science on other characters in an imperialist or scientistic manner? In other words, do people have a free choice about whether to incorporate science into their society in order to reap its potential benefits? Are they permitted by the hero scientist to choose to limit the use of science even when it is not exceptionally dangerous or unethical? To answer these questions, I will draw on the serials I identified as grappling with the 'democratisation of science for democracy' in Chapter 4 (coloured red in Tables 3-6), all of which are from the 1960s or 1980s.

Science for liberation: the hero scientist as democracy's advocate

The Doctor is certainly partial to deciding what is acceptable or unacceptable science, and what is autocratic or democratic societal governance. In most serials, the Doctor's dialogue expresses authorial perspectives on these matters. On occasion, he explicitly invites public participation in making decisions about science rather than simply imposing his own view. *The Mind of Evil* (1971) provides a notable example of this. The Doctor and Jo visit a prison to witness a demonstration of a machine that extracts "evil impulses" from criminals and "leaves a rational, well-balanced individual" who can "take his place as a useful, if lowly member of society". The machine's creator Professor Kettering promotes it as a tool of reform to replace capital punishment. The Doctor heckles Kettering throughout his demonstration, disbelieving his cornucopian claim that the machine is 'progress' ("It all depends what you mean by progress, doesn't it?"), and combatting Kettering's dismissive remark that it is not the Doctor's concern by asserting decisively "it is everyone's concern". This is an important line because it effectively invites people to protest against risky or unethical scientific developments regardless of their level of scientific training.

Similarly, on the "devolved" feudal planet in *State of Decay* (1980) where "all science, all knowledge is forbidden by the Lords" and "the penalty for knowledge is death", the Doctor helps the oppressed peasants to access the computer databank of their ancestors.

Significantly, he departs with the line, "There's all the knowledge you'll need in there. Use it well, and if that's what you want, you can be a high technological society in no time." The phrase "if that's what you want" is the only substantial difference between this serial and the Doctor's fundamentalist dogma about progress in *The Creature from the Pit* (see previous section), but it is a key difference, because it affords genuine choice and pluralist models of societal evolution (the Doctor also says "societies develop in varying ways").

In both these examples, however, the Doctor is still calling the shots on behalf of an angry but disempowered public, so neither is an example of democratic science governance in action. Even where there is a direct representation of a groundswell of public protest about science, in *Doctor Who* it is generally scientists who make the governance decisions. *The Green Death* contains all the elements for a perfect Wynne-esque scenario set in South Wales: a polluting oil refinery run by the company Global Chemicals, which promises jobs for all; a community of unemployed coal miners who need work but some of whom are killed by the refinery's toxic waste; and a commune of hippy scientists who seek sustainable solutions to the world's energy crisis and food shortages. The introduction to the scenario is in the form of a confrontation between these parties at the refinery gates, led by Global Chemicals boss Stevens, hippy biotechnologist Cliff Jones and miner Dai:

> Stevens: Coal is a dying industry. Oil is our future now and the government agrees with me. They have not only given us the go ahead for our plans, they have promised us money for future expansion. I have it here in black and white. Money for all of us! More jobs! More houses! More cars!
>
> Jones: More muck! More devastation! More death!
>
> *(Stevens consults colleagues about Jones and continues his speech.)*
>
> Stevens: It seems there are some who do not agree with my vision, of a future we hold in our hands. There are always those who resist progress.
>
> Jones: Progress? Don't listen to him. He means fatter profits for Global Chemicals. At the expense of your land, the very air you breathe. Aye and the health of you and your kids.

Dai: It's all right for you. You can afford to live the way you want to. We need the jobs. We can't live on nuts.

Jones: Can't you see you're being exploited?

Dai: Shut up, boy, or we'll shut you up.

Despite his middle class condescension that is understandably criticised by the miners, the sympathy of the story lies with Cliff Jones, who is a hero scientist of the first degree, being both a Nobel Prize winner and an unerringly nice bloke who cares about everyone. The genetically engineered high-protein fungus he has developed as a sustainable replacement for meat turns out to be a magic bullet, providing the antidote to the sickness and environmental devastation caused by Global Chemicals' toxic waste. Admittedly, this requires the serendipitous clumsiness of Jo, who spills some fungus powder onto a slide of toxic green sludge. Jo ultimately marries Cliff and asks her powerful uncle in the UN to grant funding for his commune's research, which also solves the miners' problems, since there will be jobs for them too.

The ideological closure of the serial is that sustainable science will provide a cornucopian future for the world. This may be in line with public demands for sustainability, making it more democracy-friendly than serials in which democratic dissent to science is portrayed as irrational, for example the unseen "pull back to Earth" protestors in *The Wheel in Space* (1968) who want to suspend the space program and are implied to be "maniac" terrorists. *The Green Death* does not, however, grant democratic power to the people beyond their initial demand for clean sustainable energy over polluting fossil fuels. The miners are still subject to the whims of employers, and the only other role for non-scientists (Jo's role) is to be serendipitous or to have powerful uncles. For this reason, I have not classified this serial as a 'democratisation' serial: the point, as in so much of *Doctor Who*, is simply that good science will defeat bad.

The most common category of 'democratisation' serial is that in which ordinary people seek access to life-saving scientific knowledge that is hoarded by the elite to maintain their power. *State of Decay* falls into this category. The key difference between this category and scientistic stories is that the stated problem is ignorance rather than irrationality and religiosity. It is, then, not a victory for rationalist secularism, reproducing the Enlightenment humanist victory of 'Man' over God. Instead it is a

victory for the public understanding of science: the Hodgsonian Enlightenment ideal of education for liberation (Hodgson, [1795] 1994). An underlying premise of the importance of science to liberation remains, since it is not just any knowledge, but *scientific* knowledge, that is the prize needed to effect democracy. The emphasis of these serials, however, is on *access to knowledge* rather than on *adopting correct knowledge*, the latter forming the ideological closure of scientistic or 'progressist' serials such as *The Curse of Peladon* and *The Creature from the Pit*. As such, 'democratisation' serials do not explicitly proffer a hierarchical argument for science over other belief systems, but seek to remove elitist barriers to gaining scientific knowledge should people want it. This is largely compatible with the aims of PAS.

Doctor Who's first story, *An Unearthly Child* features an earnest attempt to bring science to a "primitive" prehistoric tribe in order to effect more genuine democracy. The tribe is beholden to anyone who can make fire because they are utterly dependent on it for survival but none of them know how to make it. When the TARDIS crew are captured by the tribe, they try to bargain for their freedom with Za, a man pretending to be a fire maker because he wants to be leader:

Doctor:	Do you understand? We are making fire for you.
Za:	I am watching.
Ian:	The whole tribe should be watching. Everyone should know how to make fire.
Za:	Everyone cannot be leader.
Ian:	No, that's perfectly true. But in our tribe the fire maker is the least important man.
Za:	Ha! I do not believe it!
Doctor:	He is the least important because we can all make fire.

In the pro-colonialism serials (above), the colonised had to adopt science in order *to attain civilisation* and hence to deserve liberation. In the anti-colonialism serials, the colonised had to prove they were already civilised to show they deserved liberation: they were oppressed in part because *their scientific sophistication went unrecognised*. *An Unearthly Child* is the opposite of these. Science is again essential for the people's liberation but this is *in spite of their lack of civilisation*, and it will *not result in their civilisation*. They are despised by the Doctor for lacking a 'civilised' emotional

capacity, so they are judged by Western Enlightenment standards, but the resolution of the serial does not see the tribe punished for their 'uncivilised' nature as the Aztecs were. They are therefore not expected to conform to any Western Enlightenment cultural norms — aside from equal access to the life-preserving scientific knowledge they seek — to deserve freedom from the elitism that keeps them powerless. These people's struggle as characterised by Ian and the Doctor is for control of their own culture's science in line with Hodgsonian Enlightenment ideals. This contradicts the stagist teleological paradigm that equates freedom with a particular stage in Western history.

Nevertheless, *An Unearthly Child* is another story of Westerners bringing democracy to the oppressed rather than the oppressed actively fighting for democratic governance themselves. In a sense, the tribe members do not know what's good for them and need to be shown how to be free, so it is still far from a democratic ideal.

Full Circle (1980) and *Frontios* (1984) follow in *An Unearthly Child*'s footsteps in advocating universal access to scientific knowledge in order to effect democracy. *Full Circle* subtlely references debates about creationism and evolution. A small community of humanoids living on the planet Alzarius believe they are from another planet and will one day return there in their ship. However, the Doctor and Romana discover that the people share the same genetic makeup as the Alzarian life forms, proving they are from Alzarius. This knowledge has been kept from the people, hidden in the secret "system files", to which only the community leader has access. The people are thus disempowered, employed in useless labour preparing the ship for the journey home, while the community goes nowhere and never changes. It is only when the secret is made public that they can move on. In *Frontios*, a remote human colony's very existence is threatened by the leader's secrecy over his scientific discoveries, because they remain ignorant of a force attacking the colony when the leader is killed. Again, the revelation of this truth is needed to save the colony. Both serials depict anti-authority protests by community members in the form of thieving and looting, but as criminal acts these are not organised democratic protests, and are shown to be based on a lack of understanding of the real issue. While perhaps admirable for their resistance to autocracy (though this is less clear in *Frontios*, since the looters' point of view is not explored), the thieves and looters only become 'truly free' once integrated into society after the truth has been revealed and liberal democracy enshrined.

Neither story demands very much of science governance, other than transparency and open access to the truth, but these are themselves vital to democracy. In both cases, science's governors express ambivalence about communicating uncertain information because of the potential for inflaming public disquiet. This PUS-style argument for avoiding transparency (a) to protect science's credibility and (b) to protect the public from themselves has been shown to be unfounded even on its own undemocratic premise. People in fact trust scientists more if they communicate the uncertainty inherent in science (J. D. Jensen, 2008) and trust is easily lost if scientists falsely reassure people that there is no risk when it is later shown that there is (Barnes, 2005; Jasanoff, 1997). The resolutions of *Full Circle* and *Frontios* point to the same conclusion: that openness enables public empowerment and that this is irreducibly important.

The Krotons (1968-9) is a more straightforward case along Hodgsonian lines. The oppressors in this story are the crystalline Krotons, who require 'mental energy' to repair damage to themselves and their craft. The Krotons have enslaved the humanoid Gonds, and educate them in order to feed on their enhanced brainwaves, inviting the smartest students to join their ship, wherein the students are secretly 'eaten'. The Krotons control the Gonds' education through learning machines, but are careful to omit knowledge that the Gonds might use against them, for example the fact that the Krotons' tellurium bodies can be destroyed with sulphuric acid. This equates to a Chomskyesque metaphor for capitalism's use of the education system to perpetuate class oppression: the populace are kept selectively ignorant and therefore powerless because the education system's sole purpose is to identify the most 'intelligent', who are plucked away to serve the ruling class. Like *An Unearthly Child*, *The Krotons* is a critique of the hoarding and manipulation of science to maintain power. The Doctor's solution to the problem is to fill the Gonds' intellectual deficit with chemistry, effecting a successful revolt and the Krotons' death through the democratisation of scientific knowledge about sulphuric acid.

There is a deficit model and a science literacy solution at the base of all these serials that implies a privileged significance for scientific knowledge. What it lacks in reflexivity about the value of science, though, *The Krotons* makes up for in democratic fervour, and it does depict some nuanced variation in acceptable attitudes to science. Before the Doctor can succeed at his Hodgsonian revolution, a band of Gond luddites

attempts to smash the learning machines with axes. These luddites are portrayed primarily as ignorant, violent thugs, and their methods are ultimately found wanting in the ideological closure, giving an editorial tut to their approach to dissent. The Doctor too seems to disapprove of their methods, yelling at them to stop, but there is a twist on his objection:

> Doctor: Stop it! Stop it all of you! Listen to me. This will do no good at all. These Krotons must have enormous scientific powers. You can't defeat them with axes. [...] Now, if this was an atomic laser it might be more use.

The luddites are not explicitly endorsed goodies (and in the end try to trade the Doctor and Zoe's lives for the Krotons' departure) but the dialogue here uses humour to implicitly endorse their actions. Certainly, their analysis of the problem is not at fault, only their solution, and even then only their proposed means not their proposed outcome. They may destroy the machines, provided they use technology: an atomic laser is of course a technological solution, by the Doctor's judgement the sole empowering means. Revolution against oppression is highly desirable; the governance of science must be wrenched from the powerful; but it may only be governed by the people if they make decisions the hero scientist approves of.

Two *Doctor Who* serials cut against these PUS-style trends and depict scenarios in which the oppressed assert their own views about science and choose its role in their society. In *Time and the Rani* (1987) the indigenous Lakertyans have been enslaved by scientist villain the Rani to help her build a powerful weapon. The Rani effects control over them via a hive of insects engineered to kill at her will. The Lakertyans need the Doctor and Mel to get rid of the Rani and destroy her weapon, but once she is gone they reject further offers of help even though the hive remains. When the Doctor offers them an antidote to the insects' stings, young Lakertyan Ikona pours it out onto the sand, believing they need to meet their own challenges if they are to survive. This final gesture signifies ambivalence about the narrative role of the hero scientist, who — whether imperialist or saviour — represents one or other side of the same coin. This ideological closure suggests that science cannot fix everything or save everyone. Nor should it try, if imposing it leads to uncomfortable dependence and undermines people's self-determination.

Finally, *Terminus* (1983) demands democratic access to scientific knowledge but only alongside demands for other kinds of democracy. *Terminus* is a complex story depicting layered relations of power and dependence. An unseen corporation known only as 'the company' has control over life-affecting scientific knowledge of different kinds, and maintains power over various groups of people by hoarding this knowledge, rendering them dependent. The company runs Terminus Incorporated, a space station that serves as a hospital for people afflicted with a virulent form of space leprosy called Lazar's Disease. Terminus is popularly known as the place "where the Lazars come to die" because no one ever returns from it. The Lazars are kept in crowded rooms resembling Dickensian hospices of the future, and so are at the mercy of the company. The treatment that Terminus provides for the Lazars is a blast of radiation, and when Nyssa is struck down with the disease, she realises that the treatment can work (and cures her), but that it is not controlled properly and is therefore responsible for many avoidable deaths from radiation sickness — ultimately deaths that the company has caused through its 'closed shop' of knowledge.

Further complicating the situation are the people responsible for administering the treatment on Terminus. They are not scientists or doctors, but are expendable slaves administered by the company from a distance: the unskilled Vanir and the semi-skilled Garm. The Vanir are a group of former criminals addicted to the drug Hydromel, and they are utterly dependent upon the company because it is the sole manufacturer of Hydromel. The company sometimes flaunts its absolute power over them by substituting coloured water for Hydromel, depriving the Vanir of their fix, but knowing the Vanir are not in a position to complain. It is the job of the Vanir to triage and process the Lazars, deciding who will be treated next. The Garm is a giant beast who lives alone deep in the irradiated parts of the treatment facility where the Vanir cannot venture safely, and it is his job to administer the radiation treatment to the sick. While not directly dependent upon the company, the Garm symbolises the insidious universality of a dependent mentality because he is slave to an electronic box, obliged to obey whoever has control of it.

Terminus depicts a hierarchy of power in which everyone is controlled and in turn controls others lower down the chain via the strategic use (or hoarding) of science and technology. The Vanir leader Eirak — himself controlled by the company — controls his fellows autocratically, distributing the Hydromel at his whim, since he has the only

key to its storage vault. The Vanir collectively control the Garm with the box. The Lazars are terrified of the Garm and he has the power of life and death over them with the radiation treatment. Everyone is alienated from each other, defending the little power they have, frightened, depressed and weary. The technology is old and frequently fails to work at all. As an added complication, a broken engine of the Terminus space station threatens to recreate the Big Bang and destroy the universe. Vanir Bor has entered the irradiated area to investigate the engine, has fallen very sick as a result, and elicits the Doctor's help to stop the disaster. The Doctor in turn uses the box to elicit the help of the Garm, needing his super strength to defuse the engine. Neither cornucopian nor Romantic humanist, this is a bleak portrait of poor healthcare and disintegrated science in a highly industrialised but chronically oppressive unregulated capitalist society. Underlying it is the promise of science and technology: that if only it worked, everyone could be okay, but again, it is undemocratic science governance that is the problem.

The solution is proposed by Nyssa, who is both an affected lay person who has been cured of the disease and a skilled biochemist who can make Hydromel. She realises that the Garm is willing to help people but cannot while he is a slave. After the Garm saves the universe, he requests that the Doctor destroy the box, setting him free, and the Doctor obliges. The Vanir overthrow Eirak and seek collectivist administration of their own community, which they are able to accomplish when Nyssa agrees to remain on Terminus and work with them manufacturing Hydromel, freeing them of dependence on the company. It is, in effect, a people's revolution on Terminus, with workers of different stripes joining forces with patients and a scientist, so that they may jointly serve all of their interests, living as equals for mutual benefit instead of for profits and petty power struggles.

Of all 203 *Doctor Who* serials, *Terminus* is the only one to represent a PAS ideal of democratic science governance that goes beyond the gesture of self-determination in *Time and the Rani*. Science here is a useful tool but not a master. It is incorporated into people's lives as they wish it to be, not as any hero scientist preaches that it should be. It is even used to support a drug addiction, without the criticism accompanying drug use elsewhere in *Doctor Who* (*Nightmare of Eden* (1979), *Gridlock* (2007)). The scientists — in this case both the Doctor and Nyssa — discover what 'lay' people (workers and patients) already know, and contribute help as it is requested rather than imposing their

will on the ‘ignorant’. The ‘lay’ people frame the problem in terms that are relevant to them: primarily, in terms of workplace arrangements, politics, economics, dependence and responsibility. Qualifications and experience are both important for providing technical expertise in the sense of Collins and Evans, but the set of problems in *Terminus* extends much further than the technical risks and challenges to which such experts can speak.

Terminus suggests that it is possible to represent a radical vision for the democratisation of science in a television program that revolves around a hero scientist, but to do this requires modifications to the hero scientist formula. The scientists here are a part of the community, not special saviours as the hero scientist is in almost every other science-oriented serial. Particularly important for establishing this and undermining the hero construct is the way that oppression is characterised as institutional not individualised. It is so pervasive that the scientist cannot rise above it through specialness. This is exemplified in the interactions between the Doctor and the Garm. That the Doctor uses the box to call the Garm and give him orders demonstrates both his fallibility in failing to resist or even detect his own participation in slavery, and the ease with which any of us may be co-opted into participating in oppression against our deeply held principles. This version of the scientist meets Hourihan’s criteria for liberatory alternatives, even while retaining “the linear pattern of the hero tale”, because here neither the Doctor or Nyssa are

> fanatical men of action, noted for their outstanding prowess and courage, guided by single-minded devotion to their goals, struggling against opponents who they condemn as evil, and determinedly asserting their mastery. They are not constrained by an arid rationalism and they do not deny or distrust their emotions. They are not invulnerable to doubt, disappointment and defeat. They are not superheroes. They are like all the rest of us, and they include females, non-Europeans and other outsiders. (Hourihan, 1997, p. 233)

Oppression in *Terminus* is constituted as a norm of behaviour rather than as direct acts of violence by an autocratic tyrant (*An Unearthly Child*, *The Krotons*, *Time and the Rani*) or well-meaning autocracy by a benevolent leader (*Full Circle*, *Frontios*). The Doctor and Nyssa are thus subject to oppression too, rather than standing outside of it

telling others *they* are oppressed. Since this is the case, a single hero cannot possibly defeat the evil. Only solidarity among the oppressed and a critical mass of resistance will.

These seem like arguments for the political sphere rather than the scientific sphere, but they are important for science communication because the inequality of access to science in the 21st century West is generally a product of behavioural norms forced by structural institutional arrangements, rather than direct autocratic actions as such. Even where people are granted a platform from which to intervene in science governance such as in consensus conferences, behavioural norms usually constrain and limit that intervention, reinforcing the boundaries between 'experts' and 'the lay public' (Blok, 2007; Brown and Michael, 2001; Irwin, 2006; Moore and Stilgoe, 2009; Purdue, 1999). This speaks to the key difference between Collins and Evans, whose vision for the democratisation of science is limited to the desire to avoid purely technocratic decisions, and the likes of Wynne, Jasanoff, Irwin and Harding, whose vision extends to the limits of democracy itself: to letting people decide what to do with science in a genuinely democratic, grassroots manner. Overcoming technocracy is not a simple matter of letting people have a say on specific propositions: that is the norm of disempowerment forced by structural institutional arrangements that dominates science governance in the modern West. Framing science debates democratically from the outset is a far more radical approach that requires our most embedded cultural constructs — including that of the hero scientist — to be overturned.

The hero scientist is a problem for the democratisation of science for two primary reasons. One is scientism, in that he (very rarely she) represents the imperialist imposition of Western values on the world. The other is technocracy, in that he undermines democratic demands by saving people rather than offering his expertise for them to use in saving themselves. I address *Doctor Who*'s engagement with scientism further in Chapter 6. In the final section of this chapter I discuss the reinforcement of technocracy through symbolism that conflates scientific expertise and messianism.

The alien messiah and expert authoritarianism

In the above, my discussion of the hero scientist engaged with this archetype as a fairly abstract figure who is representative of a set of ideological values. The Doctor, though, is a specific character, or rather a set of characters, and his personal qualities have a bearing on how effectively he embodies those values, or indeed whether he embodies them at all. I finish this chapter by examining what it is about him that facilitates particular approaches to the democratisation of science.

The Doctor is — at the functional level most relevant to this work — not really that complicated. As a long-running character of multiple incarnations it is easy to get lost in the detail when attempting to characterise him: his changing use of technobabble, the scientific facts he gets right or (due to poor writing and changing scientific paradigms) wrong, his opinions about hundreds of ethical dilemmas, the interplay between his genius and irreverent silliness, the ways in which he is or is not like humans, the many thousands of cultural referents that add to his richness, the quirky personality differences between his ten incarnations. Other scholars, being more interested in the program for its own sake or as a cultural artefact, have written much on this subject (listed in Chapter 3). For my purposes it is unnecessary to revisit this, because that detail constitutes the 'attractive variety of actions' that distract our attention from the program's underlying ideological framework, to use Fiske's analytical perspective (Fiske, 1984, see Chapter 3). In essence, once the attractive variety of actions and traits that make *Doctor Who* so entertaining are swept aside, it is possible to see that the Doctor is a very straightforward, scientifically gifted, goodie hero, whose shape-shifting has accommodated the vagaries of authors who want him to represent whatever version of 'good' it is that they believe in.

Making a character represent what the author believes in to make a moral point is not unique to *Doctor Who*. Alfred Kracher (2006, p. 333) makes the general case that alien characters in science fiction often fulfil a narrative function as moral agents watching over humans and guiding us, and accordingly they "obligingly implement the philosophical position of whoever invents them". From this point of view, irrespective of the particularities of individual Doctors, the Doctor would seem to be simply one in a long line of similar characters that Ruppersberg (1990) calls "alien messiahs". Ruppersberg includes in this archetype benevolent aliens such as those from the 1970s

and '80s films *Close Encounters of the Third Kind*, *E.T.* and *Coccoon*. Alien messiahs are a special subset of donor/mentors (Vogler, 2007) or mythic/romantic heroes (Frye, [1957] 1969). They "replace despair with hope and purpose" for viewing publics who fear that "civilization has run amok and is about to destroy itself" (Ruppersberg, 1990, p. 32). Just like the Doctor, alien messiahs "offer solace and inspiration to a humanity threatened by technology and the banality of modern life" (33), coming to Earth (or to our time, from the future) to warn us of the dangers of our actions, and to reassure us that there are solutions to our seemingly insoluble problems. Like the Doctor, they are usually morally spotless, "showing no sign of corruption or natural imperfection or original sin" (35). As Lambourne *et al.* (1990) note, just like Christ they are anti-authoritarian: another trait of the Doctor. Ruppersberg documents the many ways in which the specific characters he analyses resemble the Judeo-Christian messiah, ways that mirror the traits of the Doctor, particularly in the new series: they are resurrected (the Doctor regenerates), are begotten of a male god and an Earth woman (the new series recognises the TV Movie's controversial premise that the Doctor's mother was human (BBC, 2009b)), and they carry their human friends aloft, offering them a piece of immortality (the Doctor takes humans out of their mundane Earthly existence to travel through all time and space).

Messianism is most apparent in the Series 3 finale *The Sound of Drums/Last of the Time Lords* (2007). In this story the Master gains autocratic control of the Earth and emulates a biblical quotation when admiring his dastardly work: "And so it came to pass that the human race fell. And the Earth was no more. And I looked down on my new dominion as Master of all. And I thought it good." His power is maintained through a satellite-based telepathic field, the "Archangel Network". He zaps the Doctor into a wizened old man, rendering his 'powers' impotent. It is then Martha's job to save the world, meaning she must literally resurrect *the Doctor* so that *he* can save the world. She embarks on a year long, worldwide journey, and upon her return explains its significance to the Master:

> Martha: Do you want to know what I was doing, travelling the world?
> Master: Tell me.
> Martha: I told a story, that's all. No weapons, just words. I did just what the Doctor said. I went across the continents all on my own, and everywhere I went, I found the people and I told

them my story. I told them about the Doctor, and I told them to pass it on. To spread the word so that everyone would know about the Doctor.

Master: Faith and hope? Is that all?

Martha: No. Cos I gave them an instruction, just like the Doctor said. I told them that if everyone thinks of one word at one specific time —

Master: Nothing will happen! Is that your weapon? Prayer?

Martha: Right across the world one word, just one thought, at one moment, but with fifteen satellites . . .

Master: What?

Jack: The Archangel Network!

Martha: A telepathic field binding the whole human race together. With all of them - every single person on Earth - thinking the same thing at the same time and that word . . . is Doctor.

(The whole world thinks and says 'Doctor', closing eyes in prayer. The Doctor is infused with power.)

Jack: Doctor!

Francine: Doctor!

Tish: Doctor!

Clive: Doctor!

Lucy: Doctor!

Jack: Doctor!

Martha: Doctor!

Doctor: I've had a whole year to tune myself into the psychic network and integrate with its matrices.

Master: I order you to stop!

Lucy: Doctor!

Doctor: The one thing you can't do. Stop them thinking. Tell me the human race is degenerate now. When they can do this.

(The Doctor rises, invincible and omnipotent, able to stop weapons, pull weapons to him and fly. He defeats the Master.)[37]

[37] Francine, Tish and Clive are Martha's mum, sister and dad respectively, and Lucy is the Master's wife.

The imagery of resurrection is obvious. That the Doctor casts humans' ability to worship him as evidence of their lack of degeneracy and their ability to think is symptomatic of *Doctor Who*'s fetishisation of this character and construction of him as a messianic figure. The Christian symbolism is completed by (the Biblically named) Martha playing John the Baptist to the Doctor's Jesus. When talking to people prior to the Doctor's resurrection, and despite her incredible worldwide journey — a feat of indefatiguable strength and courage that brought her fame across the globe — she dismisses her own importance:

> But if Martha Jones became a legend, then that's wrong because my name isn't important. There's someone else. The man who sent me out there. The man who told me to walk the Earth. His name is the Doctor.

It does not require a great leap of imagination to see that in the new series the Doctor embodies the alien messiah effortlessly.

Ruppersberg condemns the alien messiah films he analyses for reflecting "reactionary, defeatist attitudes in their makers and their audiences" (37) through "their rejection of science and their advocacy of the supernatural" (33), noting the paradoxical conflation of "technological sophistication and religious exhaltation" (35). The latter is an aspect of *Doctor Who* that I also find problematic, not for its embrace of the supernatural, but conversely for attributing to science the omniscient and omnipotent powers that can only belong to gods, and thus granting unwarranted cornucopian abilities and rhetorical power to science. In the new series the conflation of science, magic and divinity is shamelessly, even humorously and self-referentially embraced (Chapter 4). It could be argued, however, that this means it is less likely to grant science unwarranted powers, particularly since the new series does not indulge in rationalist scientistic preaching and the Ninth and Tenth Doctors do not claim to be scientists. The conflation of Time Lord magic and science in the scientistic 1970s is more of a problem from this perspective. If "everything that's happened in life must have a scientific explanation" (*The Dæmons* (1971)), then the Doctor breaking the established premises of a serial in an unexplained *deus ex machina* fashion (*Invasion of the Dinosaurs*) is utterly disempowering, because it simultaneously places science impossibly far from our mortal reach while forbidding us from reaching for anything else. It is no different from any other autocratic fundamentalist belief system that enforces obedience to dogma while insisting people

are not worthy to fully understand it. It may even be worse: Roy (2005) argues that scientism is the most dangerous form of fundamentalism because science and technology are already so powerful in the modern world.

It seems likely that the authors of the 1970s scientistic serials would abhor the idea that the rationalist Doctor functions as an alien messiah, given the uncompromisingly secularist commitments of the era. They would not be alone in either their abhorrence or in the inherent contradiction about this: Kracher (2006) shows that alien messiahs are present in the fiction of even the most secularist authors, including in the novel and film *Contact*, written by that pillar of rationalist skepticism, Carl Sagan. Kracher writes that the aliens in *Contact* "in many ways exemplify the attributes of the god their author didn't believe in" (Kracher, 2006, p. 334), most significantly immeasurable benevolence and omnipotence. I would also add mystery. All of these alien messiahs have an unfathomable, untouchable quality, and we must wait for them to come to us: we cannot contact them. If part of the Doctor's appeal lies in the fact that he makes everything better (Ruffles, 2008), surely another part — drawing on my own experience as a *Doctor Who* fan — is the aching desire for him to find us individually among the thronging masses, to alleviate our individual "despair and sense of unimportance" (Ruppersberg, 1990, p. 32), for him to 'pick me' and reassure me that I am worthy.

Rationalist or not, the Doctor is benevolent, relatively omniscient and omnipotent, and mysterious. In all of these qualities and beyond them, he is *special*. While his specialness is cultivated throughout the series to greater or lesser extents, it reaches its zenith in the scientistic 1970s and the cult of Doctor 2000s. In both these eras the Doctor's alien biology is emphasised and his omniscience is almost limitless: he is an alien messiah. The Doctors of Pertwee, Tom Baker, Eccleston and Tennant are all donor/mentors rather than heroes in Vogler's (2007) typology, and romantic or mythic mode heroes in Frye's ([1957] 1969) typology. Only in his final season did the Fourth Doctor mellow; otherwise these Doctors make virtually no errors. The only time the Third Doctor errs is in his final story *Planet of the Spiders* (1974), when his "greed for knowledge" is characterised as a problem, and remedying it leads to his regeneration.[38] The Fourth Doctor almost errs in *Genesis of the Daleks* (1975), making the mistake of sending Sarah and Harry into a holocaust, but chance saves them from death. The Tenth

[38] See footnote 57 (p. 245) for a comment on the similar regeneration scenario of Tennant's Doctor, which occurred in a serial outside the defined dataset of the thesis.

Doctor is called to account by arch-enemy Davros (*The Stolen Earth* (2008)) for turning his companions into the soldiers that he refuses to be himself, although this accusation has no material impact and does not lead to his failure in any sense. By contrast, the Doctors of Hartnell, Troughton and Davison are by and large learning heroes not donor/mentors (Vogler) and thus spend considerable screen time in fallible mimetic mode (Frye). The Doctors of Colin Baker and McCoy are different again, with Colin Baker something of an abusive antihero just as Hartnell had been in his first few serials, and McCoy taking a backseat to companion Ace (discussed in Chapter 7).

Doctor Who's ratings have generally been highest in the eras of the most messianic Doctors (Figure 4, Table 6). Ratings during the 1960s steadily decreased after an early peak associated with 'Dalekmania' (BBC, 2009a; Sullivan, 2009), i.e., a peak thought to have had little to do with Hartnell's Doctor as such. Viewers steadily grew during Pertwee's tenure to a peak in the early Tom Baker years. Baker managed to hold onto relatively high ratings during the last years of the 1970s, suggesting the popularity of his early years was not only due to the Hinchcliffe/Holmes production team and its spectacularly well-reviewed serials (footnote 28, p. 111). It seems significant that Baker's ratings dropped significantly in his final season, when his Doctor shrugged off the trappings of the alien messiah and romantic hero and became far more pluralist, fallible and uncertain in his commitments: that season's ratings mean was among the lowest in the series' history. The ratings then peaked moderately but briefly for Davison's first season but fell again throughout the '80s, finally reaching their nadir during the McCoy years (Figure 4, Table 6). Tom Baker won every single *Doctor Who Magazine* reader poll of 'best Doctor' (except one in 1990, won by McCoy) until 2006, when Tennant won it (BBC News, 2006a).

This is quite depressing when viewed alongside the patterns that emerge with respect to the democratisation of science when different eras of *Doctor Who* and different incarnations of the Doctor are compared. The imperialist tendency was most obvious in the 1960s and 1970s, while all the 'democratisation' serials were from the 1960s and 1980s. In other words, in the fallible '60s these ideas were contested, the messianic '70s were concerned more with intellectual imperialism and less with democracy, and in the fallible '80s democracy was the priority. In Chapter 6 I show that the 1970s, particularly under Tom Baker, is the decade most scientistic and forgiving of science, while the1980s era of Colin Baker is on average highly critical of science. In Chapter 7 I show

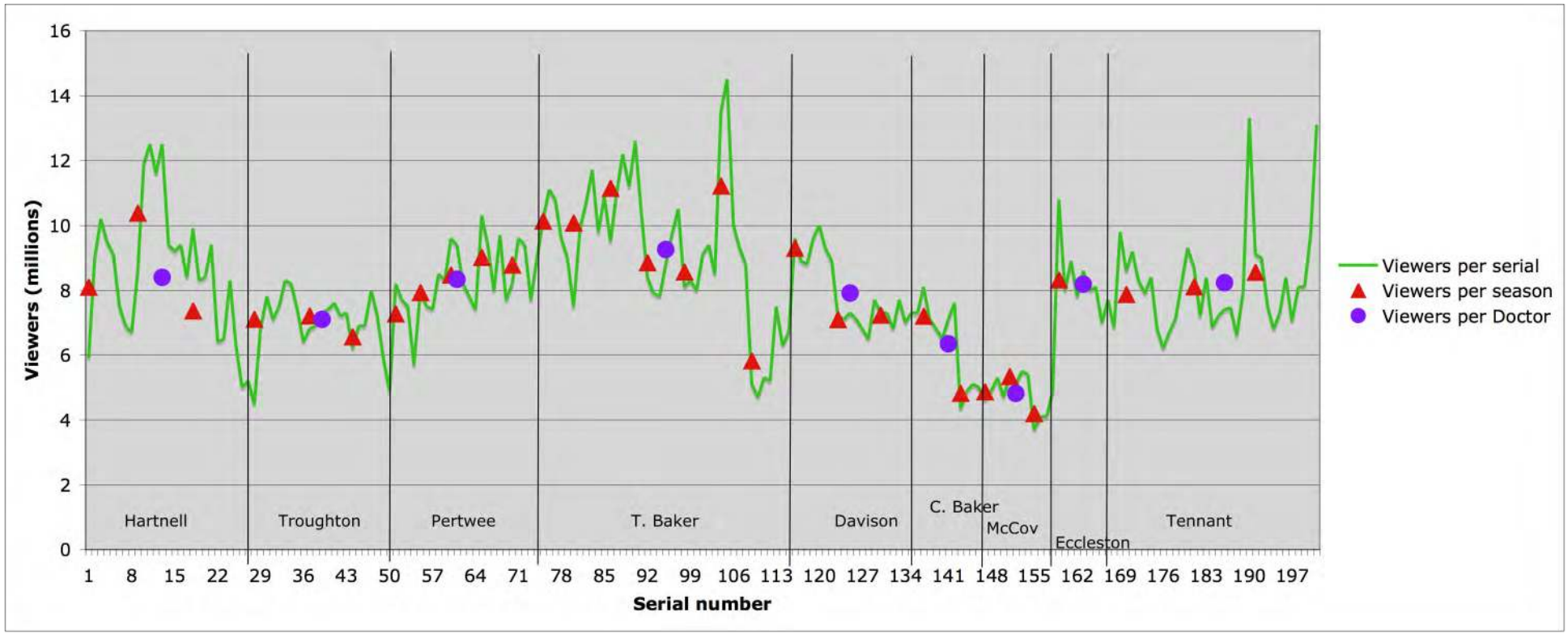

Figure 4. First UK broadcast mean ratings (in millions of viewers per episode), by serial, by season/series, and by Doctor (calculated from figures held at Sullivan, 2009). Season/series means include specials broadcast the same year. Exact mean figures for seasons/series and Doctors may be viewed in Table 6.

Table 6. First UK broadcast mean ratings, by season/series and by Doctor (calculated from figures held at Sullivan, 2009). Series numbers include Christmas specials broadcast the same year, and *The Five Doctors* is included in season 20.

Season/Series	*Ratings (millions per episode)*	*Doctor in that season*
1	8.10	Hartnell
2	10.39	Hartnell
3	7.37	Hartnell
4	7.11	Hartnell/Troughton
5	7.21	Troughton
6	6.57	Troughton
7	7.28	Pertwee
8	7.95	Pertwee
9	8.48	Pertwee
10	9.02	Pertwee
11	8.78	Pertwee
12	10.14	Tom Baker
13	10.08	Tom Baker
14	11.15	Tom Baker
15	8.85	Tom Baker
16	8.57	Tom Baker
17	11.22	Tom Baker
18	5.83	Tom Baker
19	9.30	Davison
20	7.10	Davison
21	7.24	Davison/Colin Baker
22	7.20	Colin Baker
23	4.83	Colin Baker
24	4.88	McCoy
25	5.35	McCoy
26	4.20	McCoy
Series 1	8.32	Eccleston/Tennant
Series 2	7.88	Tennant
Series 3	8.11	Tennant
Series 4	8.56	Tennant

Doctor era	*Ratings (millions per episode)*
Hartnell	8.39
Troughton	7.10
Pertwee	8.34
Tom Baker	9.26
Davison	7.91
Colin Baker	6.34
McCoy	4.81
Eccleston	8.18
Tennant	8.23

that even though the number of female scientists surpassed the number of male scientists in the 2000s, equalising numbers well beyond the attempts of any decade of the original series, the new series' treatment of female scientists is notably poor in terms of science workplace equality, while the 1960s and 1980s stand out as more empowering. Hence: positive contributions to the democratisation of science are loosely correlated with low ratings. The obvious question is: is this relationship causal? No doubt there are many factors affecting ratings that need to be considered, including purely historical factors and production contingencies that are beyond the scope of this thesis to research; indeed, even those devoted to researching such factors cannot necessarily isolate causal relationships.[39] Since I have not empirically investigated audience responses to *Doctor Who*, the question will remain unanswered here, but in general it is an important point for future research to follow up on. If approaches to production that promote the democratisation of science render a work of fiction unpopular, the prospects for using fiction to serve PAS ideological ends are not good.

It is not difficult to see that a messianic, omniscient Doctor is limited in how much he can contribute to the democratisation of science. If democratisation is about choice at a radical level, then having a messiah tell us what to do is not democracy. There is little difference between messianic governance and technocratic governance by scientist experts. Sometimes governance from above is necessary, for example in crisis communication situations where disaster looms and experts need to instruct people on the safest course of immediate action to minimise loss of life (Lundgren and McMakin, 2009). Significantly, such crises are the bread and butter of *Doctor Who*, allowing the Doctor to routinely assert his omniscient authority and act as saviour without him seeming authoritarian. Also adding to this impression is his active opposition to the authoritarianism perpetrated by villains. The occasional glimpses of irreverence and affection seen in the Doctor serve to reinforce his 'humanity' and our perception that he rejects controlling behaviours (Fiske, 1984): these are critical traits for promoting trust in an expert where their assertive authority is otherwise present (Hosman and Siltanen, 2006). Therefore, even without a crisis, the Doctor can act as authoritarian expert and still seem like a nice bloke who wants what is best for people. In effect, he gets away with authoritarian messianism by balancing it with silliness.

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[39] For example, the program's ratings fell after it returned from an 18 month hiatus in the middle of the Colin Baker era (having almost been cancelled entirely), but questions remain about whether the hiatus itself caused the low ratings, or if other factors such as Baker's portrayal were to blame (Sullivan, 2009).

Tulloch and Alvarado assert that he maintains his separateness from authoritarian, ultrarationalist villains via his "constant flux of experience, the capacity as it were, to be born again and again" (1983, p. 139). This grants him a unique grasp of humanism and ethics in any situation as well as rationalist scientific-technological knowledge. As a result, he even has a monopoly on what Collins and Evans (2002) call experience-based expertise. In the real world, non-scientific expertise developed within communities affected by science in specific places, times and circumstances has been critical in shifting scholars' understandings of expertise away from the technocratic (e.g. 'lay expertise' investigated by Epstein, 1996; McKechnie, 1996; Wynne, 1992a, 1992b). The narrative demands of *Doctor Who* reduce such expertise to the status of a mere problem of political logic to be solved, and the Doctor, with a "constant flux of experience" to draw upon, can achieve this. The Doctor thus undermines the significance of localised, situated knowledges by being the best expert in every conceivable domain, including other people's lives. For example, in *The Monster of Peladon*, the local miners go on strike, protesting new technology imposed on them by interstellar commercial interests. The Doctor breaks the strike and brokers a deal between workers, big business and the local ruling class. He exposes the business representatives as corrupt, puts the miners back to work, and co-opts the workers' leader (symbolically a union boss) into a position of power as advisor to the Queen. He thus symbolises the democratic imperative, providing expertise in achieving democracy as suggested by script editor Terrance Dicks (see Chapter 3). In effect, however, he *prevents* a working class revolution and ignores the deeper issues faced by the miners.

In this, there is no accountability, there are no consequences for being wrong. The Doctor moves on, avoiding being the first up against the wall when the workers take power, being assassinated by the Queen for betraying her class interests or being torn to pieces by the warring parties who still have business to sort out. This is problematic for the democratisation of science because the Doctor wields power without responsibility. Unlike the scientists and politicians behind the UK BSE crisis, the Doctor is never called to account for his poor decisions because *the grounds on which his authority rests are never challenged*. In turn, this is because the grounds are granted by a higher power beyond our reach — be it 'God', the 'Time Lords', or 'Scientific Truth'. The conflation of these three things takes science out of the hands of the people and glorifies it as the domain of specialised experts. In *Underworld*, the Doctor reassures Leela (and through her, audiences) that people in Aberdeen absorb more radiation from granite

than do people who work in nuclear power plants: that, effectively, nuclear energy is safe. Yet this did not come back to bite him at Three Mile Island and Chernobyl because his omniscience-omnipotence puts him beyond reproach. Within the fictional universe of the program, he is able to literally escape to the past, future or other planets, which removes the ability of locals to hold him accountable. In terms of the real universe, his narrative function as messianic eternal expert — as knower of what is right, whatever that may be at the time — means that in many ways he does not represent anything at all. Anything at all *except authority.* Perhaps this should not surprise us: Nikolajeva states that hero characters generally "have few other traits than being heroic" (Nikolajeva, 2001, p. 435). It is no wonder then that fans cannot agree upon the Doctor's political commitments (McKee, 2004). He has — literally — no standpoint. He is neither an anti-nuclear campaigner working against the powers that be to get nuclear materials banned and possibly being thrown in jail, nor the government minister responsible for signing off on a nuclear ban or a new power plant and getting voted out at the next election, nor even the nuclear scientist who must write a report on nuclear safety and defend it to the public when it goes wrong and never work again if this fails. Where was the Doctor at Chernobyl? Why didn't he tell them what would happen or fix their engineering? In a non-technocratic society, the consequences for policy advisers emerge from a matrix of political, economic and other material factors. But the Doctor endures no consequences. He is simply right on any given issue.[40] The messianic status of the Doctor eliminates our ability to choose how to manage science for ourselves, and eliminates our ability to protest his management decisions. The Doctor in this mode — a mode that has dominated his most popular eras — is not a friend to the democratisation of science.

In this chapter I have shown that the *Doctor Who* formula with a hero scientist at the centre is not conducive to role-modelling democratisation even when the scenarios it sets up reflect real life conflicts over science governance. Links between the hero device and the alien messiah device emphasise why this is the case, because saviours resemble technocratic experts too closely. Resolving conflicts at the community or societal level

[40] This is critiqued to a limited extent in the new series in the altercation he has with Martha over her joining UNIT (*The Sontaran Strategem* (2008)). She says someone needs to stay behind and work for change from the inside: this is in effect an attack on him for being able to leave. As noted in Chapter 7, however, the script deflects attention away from this challenge because the Doctor instantly twists the conversation back into one about Martha's moral choices, not his. The Doctor's constant travelling is critiqued to a greater extent with respect to his personal relationships, for example when Sarah returns (*School Reunion* (2006)) and reminds him of the trail of broken hearts he leaves behind him, but he explains it away as a burden of immortality, and in any case this is not particularly relevant to the democratisation of science.

relies upon changes to the material structures of governance, and the Doctor/hero/messiah is almost always too purely ideological to have a useful role in effecting such changes.

This does not mean there is no role in democratisation for the purely ideological. In the next chapter I discuss the ideological function of scientist villains as more symbolic manifestations of public protest against the excesses and unethical excursions of science.

CHAPTER 6 INSANITY AND UNCERTAINTY
THE 'MAD SCIENTIST'

Half a century ago, just before *Doctor Who* began, Walter Hirsch conducted a landmark sociological study of the image of fictional scientists (Hirsch, 1958). Scholarly work investigating and debating the cultural function of fictional scientists, particularly scientist villains, and their significance for public attitudes to science, continues today. Scientist villains have been characterised as critical to the democratisation of science because they have been seen as a form of democratic protest, expressing public opinion about science via an authorial critique.

An illustrative example of this phenomenon comes from *Planet of Giants* (1964), a *Doctor Who* serial that metaphorically references the controversy over the use of DDT. The TARDIS crew find themselves shrunk to insect size in a 1960s suburban lawn, surrounded by seemingly giant, but dead, insects and worms. Effluent from a private laboratory adjacent to the lawn has killed these animals after the lab's scientist Smithers naively invented the powerful pesticide DN6, his altrustic goal being to "save people from dying of starvation". The serial powerfully demonstrates the devastation wreaked by the chemical by filming it from the 'ant's-eye' view. DN6 becomes particularly frightening when miniature Barbara is struck down ill having absorbed the poison through her skin. Dialogue makes clear the authorial disapproval of DN6 and of scientist Smithers, and, allegorically, of DDT:

> Barbara: What would kill insects in a perfectly ordinary garden? I mean, pests one can understand. But surely it's wrong to kill bees and worms and things?
>
> Doctor: Quite so. Both are vital to the growth of things.

When Smithers reads a report by government scientist Farrow on the negative consequences of his invention, he is appalled at the 'monster' he has created and renounces it. Forester, the capitalist who funded the research and murdered Farrow to protect his profit, is ultimately arrested, thanks to the interventions of the TARDIS crew. Although there is no direct democratic involvement of the public in the serial as 'lay' characters, real world public concerns are expressed through thinly disguised

metaphor. They are transformed into a clear moral tale in which profiteers of dangerous science are punished, careless scientists are rendered subject to effective regulation, and the threatening development is halted.

But do all scientist villains serve this end of public protest? In this chapter I examine the characterisation of scientist villains in *Doctor Who* and the ideological messages about science that they ultimately serve. In doing so I engage with the topic that has received the most attention from science communication scholars studying fiction: 'mad scientists' and their meanings for science. In the first two sections I demonstrate that *Doctor Who* undermines or circumvents the protest function of scientist villain characters in multiple ways, framing them in such a way that they inadvertently promote and defend science, or rendering them irrelevant to democratic debates about science.[41] In the final section I examine those scientist villain characters who do serve the conventionally defined function of antiscience critique, to understand what is being critiqued and how. The data for the chapter are the serials whose interventions into the relationship between democracy and science are metaphorical and symbolic and speak to values at the universal level.

The 'mad scientist' trope

Scholars in the science communication field commonly claim that fictional representations of scientist villains largely represent a critique of science related to societal discomfort or negativity towards science (Frayling, 2005; Haste, 1997; Haynes, 1994, 2003; Millhauser, 1973; Toumey, 1996; Weingart, 2006; Weingart et al., 2003; Weingart and Pansegrau, 2003). Such views are not confined to the academy and commonly appear in reference to 'mad scientists' in popular works on fiction (e.g. Searles, 1988) or science (e.g. Jeffrey, 1997; Marshall, 2008). The recurrence of negative imagery and stereotypes in public debates over science controversies, for example caricatures of Frankenstein's monster used in discussions of biotechnology, has contributed to this view (Haynes, 2003; Turney, 1998), as has the fact that fictional scientist villains are generally more well known than real scientists (Haynes, 1994). As noted in chapter 3, Kirby (2003) cites numerous scientist voices, including the US

[41] Sections from the first part of this chapter have been published (Orthia, in press-a).

National Science Foundation, who object to fictional representations of scientists on the grounds that they are predominantly negative and damaging to science.

These authors differ in their assessment of whether such 'damage' to science is warranted, and whether it is desirable. Weingart (2006), for example, acknowledges science's potential for creating danger and destruction, but is highly concerned about negative characterisations of scientists in fiction because of their potential for inflaming antirationalist ideologies including creationism. Haste (1997), on the other hand, is more moderate in characterising mad scientists as modern manifestations of 'our' cultural heritage, implying they are a legitimate expression of public sentiment.

Regardless of these different motivations and ideological orientations, much of the literature as it currently stands rests upon the assumption that scientist villains or 'mad scientists' always constitute an authorial critique of science. Locke (2005) is an exception who considers scientist characters in superhero comics to be indicative of ambivalent authorial attitudes towards science, not a unitary critique. Haynes' (1994) work, too, shows that changing social attitudes to science have produced diverse representations of scientists in fiction, including a range of 'goodie' scientists. Similarly, in his study of horror films, Andrew Tudor (1989) notes variation in the extent to which blame for science-related threats is attributed either to scientist villains or alternatively to 'natural' externalities such as radioactivity. He links such variation to historical trends in public attitudes towards science, for example showing that during the 1950s and early '60s, at a time of pro-science sentiment in the West, scientist characters were largely, but not entirely, relieved of responsibility for the creation of science-based threats.

These considerations have not mitigated the views of some scholars. For example, Weingart warns that "the mad scientist of the movies" is the "natural opponent" of science policy makers and proponents of science (Weingart, 2006, sect. 1). In mounting this argument he draws on Toumey (1996), who is unequivocal in identifying mad scientists in gothic horror fiction as a Romantic antirationalist critique. Haynes, too, has emphasised the image of the scientist as "an evil and dangerous maniac, obsessive, secretive, ruthless, and arrogant" over and above the more ambivalent or positive images she has documented, by naming it "the master narrative of scientific knowledge in both literature and film" (Haynes, 2006, p. 5).

Based on this body of scholarly and popular work, the stereotype of the 'mad scientist', together with the assumption that it essentially constitutes a critique of science, has become a trope, meaning an epistemic construct which functions as shorthand for an entire package of cultural ideas. Not only is the 'mad scientist' an actual cultural stereotype, but it is widely understood to be a stereotype, and so as a label is frequently applied to scientist villains with little deeper analysis of the diversity of their manifestations, as any internet search will attest. Even in scholarship the phrase is used rather arbitrarily, for example, while Haynes' (2003) definition of the "mad, bad, dangerous scientist" stereotype specifies megalomaniacal ambitions, Tudor (1989) uses the term as a catch-all for scientist villains. Flores (2002, p. 646) defines the medical mad scientist as "the physician who values research much more than the patient", but this is more consistent with Haynes' "inhuman researcher" stereotype, as are Kawana's (2005) "mad scientists". If the mad scientist has become so culturally familiar as a trope that we no longer see what is there nor cognitively process its meaning, then we must approach its examination with fresh eyes.

Scientist villains in *Doctor Who*, like Locke's (2005) comic superheroes, often represent authorial ambivalence towards science, and there are some who narratively function as vehicles for pro-rationalist, scientistic ideology. This chapter therefore aims to challenge the mad scientist trope with a discussion of these examples that contradict its assumptions. This does not mean discounting the importance or prevalence of the scientist villains who *do* constitute an antirationalist critique, but identifying them is not necessarily a straightforward task. Elements of characterisation and setting that scholars have identified as common to works they consider to be antirationalist, such as scientists working alone, at home, and in secret (e.g. Haynes, 1994; Weingart, 2006) — in other words, elements that have become a part of the mad scientist trope — do not, for example, in and of themselves, indicate an antirationalist orientation where they appear in *Doctor Who*. Other aspects of production suggest very different interpretations. It is the task of this chapter to bring these to the fore, to challenge the simplistic view implied by the trope, and to contribute to a more nuanced understanding of the ideological significance of scientist villains.

I approach this argument from two directions.

In the next section, following Toumey (1992, 1996), I re-examine the gothic horror texts including *Frankenstein, or The Modern Prometheus* and *The Strange Case of Dr Jekyll and Mr Hyde* to show that gothic horror fiction does not always preach against science. I then analyse eight mid 1970s *Doctor Who* gothic horror serials that feature prominent 'mad scientist' characters, and show how their rhetorical framing of villainy and science can in fact make a critical contribution to a scientistic moral message.

Following that, I apply Haynes' (2003) stereotypes to *Doctor Who*'s 121 prominent scientist villain characters. I argue that inherent to some stereotypes are qualities that deflect attention away from characters' science orientation, and thus away from debates about science and towards more general ethical dilemmas. Character traits such as criminality, non-human biology or gender non-conformity can function in the same way. I also note the mitigating impacts of having more than one scientist stereotype in a serial, including the Doctor as noble scientist: such serials often reflect net support for science.

Having then established which scientist villains *do* represent science, in the final section I characterise the kinds of concerns about science that these villains illustrate, and hence the terms they set for authorial critiques of science.

Scientist villains: fifth column of scientism?

Re-reading gothic horror's function: not just antirationalist critique

In his study of adaptations of the Frankenstein and Jekyll stories, Toumey (1992, 1996) contends that mad scientist characters represent an antirationalist critique of science, specifically in gothic horror fiction. He states:

> Stories of mad scientists, whether textual or cinematic, constitute an extremely effective antirationalist critique of science. They thrill their audiences by brewing together suspense, horror, violence, and heroism and by uniting those features under the premise that most scientists are dangerous. Untrue, perhaps; preposterous, perhaps; low-brow, perhaps. But nevertheless effective. (Toumey, 1992, p. 434)

Underlying his work is an assumption that negative characterisation equates to condemnation of science; an assumption largely unchallenged by other scholars (except for Locke (2005)), which it is the first aim of this chapter to dispute. It may be true that on average, characterisation of scientists in Western fiction has been negative, particularly in the gothic horror genre, in the sense that there are more 'baddie scientists' than 'goodie scientists'. It may be true that regardless of what specific texts actually say about science, their negative imagery and stereotypes have been used in the public arena to characterise and disparage real science (Haynes, 2003; Turney, 1998). This is not grounds, however, to claim that an antiscience critique is the only reading of the scientist villains.

Toumey notes that, over time, adaptations of the Frankenstein and Jekyll stories increasingly abbreviated the scientist's personality, reducing it to "a simplistic symbol of the evil of science" simply to start the action (Toumey, 1992, p. 429). Haynes (1994, 2003) similarly notes the repetition of scientist villain stereotypes, imagery and motifs throughout Western literature. But does this stereotyping always constitute evidence of an extensive and pervasive cultural critique of science?

I suggest not. For example, Toumey (1992) reads the scientist in *The Rocky Horror Picture Show* (Sharman, 1975), Dr Frank-N-Furter, as an indictment of scientists because his characterisation draws on imagery, dialogue and plot elements from *Frankenstein* (Whale, 1931) and like Victor Frankenstein, Frank-N-Furter exhibits 'negative' personality traits. This, however, misses the point of the film and its controversies: its narrative concerns sexual identity (Miserandino, 1999), not science, and it exploits the classic imagery to draw out its homoerotic possibilities, not to restate an antirationalist critique. As with other fiction (Davies, 1990; Millhauser, 1973), science provides the science fiction elements needed to drive the story, but science is not the focus. Though a character may be designated 'scientist', their dramatic function in a text can be something else, and their profession largely incidental to themes and plots.

Toumey's argument somewhat overreaches itself, in that it uses genealogically linked instances of two mad scientist characters to make a general case about all mad scientist characters. Toumey also ignores the nature of adaptations despite the fact that he claims to approach his work in terms of "the artistic processes by which a narrative moves

from a textual form to drama and cinema" (Toumey, 1992, p. 412). Adaptations, and particularly the sequels and parodies that make up the large part of Toumey's study, *by definition* draw on characters assumed to be familiar to audiences, and therefore a simplification of the exploration of a character's personality is not necessarily indicative of anything more sinister. Adaptions thus do not necessarily reflect badly on science just because they pare the scientist character down to its evil essence. Toumey essentially makes this point, attributing the heightened stereotypical characterisation to the adaptation process rather than to social attitudes to science, but he passes over nuances in the scientific orientations of the scientist characters.

In addition, Toumey claims that mad scientist-based fiction is "exceptional" (434) amongst genre film and literature in its representation of moral consequences. He compares mad scientist fiction to romances and westerns, stating that whereas the latter do not signify fear of lovers or cowboys, mad scientist literature does signify dissent to and fear of science. No reason is given for why these genres should differ in their impacts; it is entirely possible that if good lovers and bad lovers 'educate' audiences about how to negotiate love, and good and bad cowboys 'educate' us about balance between lawfulness and individualism, good scientists and bad scientists might 'educate' us about how to negotiate science, showing us where the ethical boundaries lie, the positives and negatives.

Part of the problem is the transformation of the 'mad scientist' into a trope with little nuance in how the term is used. For example, Toumey names gothic horror as the source of the mad scientist subgenre, casting it as the English manifestation of European Romanticism (Toumey, 1996). Even if correct, this is a recursive argument: only stories which make Romantic, antirationalist critiques are allowed membership of this subgenre, yet Toumey proffers examples from the subgenre as evidence of an antirationalist critique. This reflects neither the breadth of fiction about scientists, nor even the breadth of gothic horror fiction about mad scientists.

A comparison of the original novels *The Strange Case of Dr Jekyll and Mr Hyde* (Stevenson, [1886] 1994) and *Frankenstein or, The Modern Prometheus* (Shelley, [1818/1831] 1994) elucidates this point. Toumey reads both Victor Frankenstein and Henry Jekyll as mad scientists giving science a bad name. I agree that the original *Frankenstein* is an indictment of science (though see Haste, 1997 on this), but I read

Jekyll differently. Science in fact plays a trivial role in the moral message of Stevenson's novel. Whereas Frankenstein implores fellow scientist Walton to steer away from dangerous knowledge and scientific curiosity because of its potentially horrific consequences — this is the ideological closure of the novel, as evidenced in Walton's eventual abandonment of his research — Jekyll offers no such advice to his fellows. Jekyll laments the consequences of his scientific studies, but not because of science's power to unleash horrors. It is because science revealed the horrible truth of "the thorough and primitive duality of man" (Stevenson, [1886] 1994, p. 70), that "This [Hyde], too, was myself" (73). It is nature, not science, that Stevenson identifies as the problem. Jekyll explicitly absolves science: "The drug had no discriminating action; it was neither diabolical nor divine; it but shook the prisonhouse of my disposition; and [...] that which stood within ran forth" (74).

The novels also differ in explanations for why each scientist will not divulge the secret of their 'evil' science. For Frankenstein it is a matter of principle to prevent such evils from occurring again (Shelley, [1818/1831] 1994, p. 203). Jekyll's reason for not divulging is that it would be pointless, in part because his discovery was due to chance not design. He was unable to replicate it in the absence of the "unknown impurity which lent efficacy to the draught" (87); hence, it was not methodical rationality that enabled the horror, it was a convenient random factor. Stevenson has the opportunity to rhetorically frame his story as a condemnation of scientific curiosity, but does not take it. This may be because he did not wish to condemn science at all: MacDuffie (2006) interprets the novel as an exploration of the principles of thermodynamics, noting Stevenson's engineering background, while others offer interpretations of the work that have nothing to do with science, for example Showalter (1990) interprets Hyde as the manifestation of Jekyll's closeted homosexuality. Images of secret experiments in secluded laboratories may compound existing archetypes of 'evil alchemists' (Haynes, 1994), but to imply that every story invoking such imagery sends the same messages about science is to assume too much.

This is also clear in serials from *Doctor Who*'s gothic horror era, which are the core material for this section of the chapter. The essence of my analysis is that the authorial intention in many cases is to deliver *pro-science* ideologies to viewers, contrary to the expectations expressed in the literature. This is primarily accomplished by challenging scientist villains' claims on the identity 'scientist'. Thus, while the villains remain

villains, they are shown to embody the antitheses of science *qua* science, rather than serving as its representatives.

Intrinsic to this is the program's use of empiricist and contingent repertoires (Gilbert and Mulkay, 1984). An empiricist repertoire grants objectivity and thus legitimacy to scientists by depicting their actions and beliefs "as following unproblematically and inescapably from the empirical characteristics of an impersonal natural world" (Gilbert and Mulkay, 1984, p. 56). A contingent repertoire does the opposite, inscribing actions and beliefs as "significantly influenced by variable factors outside the realm of [empirical] phenomena" such as "personal inclinations and particular social positions" (57). I discuss three kinds of rhetorical frame that employ a contingent repertoire to challenge villains' 'scientist' identity. First, I look at challenges issued through the Doctor's overt boundary work in defining what is and is not science. Second, I discuss the invocation of the trait of 'madness' not as an emphasiser of a character's 'evil science', but to pathologise their evil as caused by something that lies clearly outside of science. Finally I identify more covert challenges that impugn a character's ability to do credible science.

Defining the boundaries of science and non-science

As noted in Chapter 4, in many 1970s serials, *Doctor Who* unabashedly delivered pro-rationalist messages through dialogue, often as overt scientistic preaching by the Doctor. Companions, too, played their part. In *Horror of Fang Rock* (1977), set in an Edwardian lighthouse, a local woman's belief in astrology was countered by Leela's evangelical testimony that, "I too used to believe in magic. But the Doctor has taught me about science. It is better to believe in science." The endorsement of science by both the Doctor and Leela makes at least this aspect of authorial intention clear.

But the endorsement of science occurs in the larger ideological context of Western Enlightenment values and Hegelian stagism (Hegel, [1807] 1977) that I discussed in Chapter 5. The authorial fear of losing 'civilisation' is apparent in the Doctor's dialogue, when he warns against actions that threaten to plunge humanity 'back into the dark ages'. According to *Doctor Who*, the action most likely to accomplish this degeneration is superstitious or mystical belief, and this discourse is also used to indict

scientist villains, excluding them from the community of scientists by showing them to subscribe to 'backward' and even antirationalist beliefs. This is illustrated in serials that paid overt tribute to the 'mad scientist' classics *Jekyll* (*Planet of Evil* (1975)), *Frankenstein* (*The Brain of Morbius* (1976)), and *Faust* (*The Talons of Weng-Chiang* (1977)). These three serials reproduce gothic themes and imagery, but in aspects of dialogue and plot resolution the legends are presented as pro-science tales.

Professor Sorenson in *Planet of Evil* is, like Jekyll, a scientist whose investigations lead to a hideous and homicidal transformation. His home world's sun is dying, so he seeks a new energy source from a portal to an antimatter universe. Sorenson collects antimatter crystals that have condensed around the portal; these contaminate him and initiate his transformation into the Hyde-like "antiman".

Although it features a scientist villain, this is not an antiscience story, primarily because the interventions of the Doctor and the depiction of the consequences *for science* of Sorenson's actions steer the moral compass away from a critique of science. Sorenson transgresses an ethical boundary by hoarding the dangerous crystals, but the Doctor rhetorically counters this with a lecture on science ethics: "You and I are scientists, Professor. We buy our privilege to experiment at the cost of total responsibility." He thus frames science as fundamentally an ethical institution, which Sorenson is at risk of departing from. The Doctor also frames Sorenson's particular interest in antimatter not as *evil science*, but as *poor science*, confirming several times that Sorenson's theory is wrong without even needing to test it. Sorenson's 'antiman' transformation thus symbolises not so much a danger inherent in science, but the loss of the ethics and reason intrinsic to scientific 'civilisation', and the consequent emergence of 'primitive' nature in the form of a grunting monster. Science is not to blame, it is an illness: "He's been infected with antimatter. His brain cells are being destroyed. He'll descend to the level of a brute." While Sorenson's actions bring death, he faces neither punishment nor shame from the Doctor or his fellows, and loses the memories of his homicides, absolving him of accountability. The Doctor ultimately endorses his altruistic motives, saves his life, and finally helps him to access alternative energy sources, restoring him to the rational 'civilised' state of scientist hero.

Even *Frankenstein* ends up a pro-rationalist tale at the hands of *Doctor Who*. *The Brain of Morbius* brims with gothic horror imagery: a dark and stormy night, a castle lit by

candlelight, creaking doors, and alchemical laboratories of bubbling chemicals. Castle-dweller Dr Mehendri Solon seeks a humanoid head with which to restore to power the warmonger Morbius, whose brain he keeps alive in a jar. Like Frankenstein, Solon has constructed a hideous (but headless) monster from other bodies, using his scientific specialisations of microsurgery and tissue transplantation. Local mystics, the Sisterhood of Karn, condemn Solon's secret work as "unnatural", but again science does not take the blame. The story's core problem shifts from science to politics when the Doctor recalls that Solon abandoned his post as "one of the foremost neurosurgeons of [his] time" and "joined the cult of Morbius", who the Doctor describes as a "war criminal" and "ruthless dictator". In other words, Solon traded his respectable interest in science, endorsed by the Doctor's appreciation of his work and his publication of a scientific book that the Doctor refers to, for evil political ambition of a quasi-religious variety. He has gone one step further than Sorenson and departed from science and enlightenment. Science may be his means but the Doctor does not object to this; it is the end that the Doctor objects to, an end that is decidedly outside of science. Even so, the means are less than effective: the ultimate failure of Solon to construct a properly functioning body for Morbius signifies the deterioration of his scientific skills under the influence of his new ambition.

The serial's subplot concerns the aforementioned Sisterhood, whose "sacred flame" which keeps them immortal has almost gone out. They attribute this problem to supernatural forces, but the Doctor notes that, "if it's dying there must be a reason - a scientific, physical reason", and fixes the flame with geochemical science and a firecracker. Both subplots, then, preach that rational science as a system of belief is to be embraced, not rejected.

The Talons of Weng-Chiang's twist on the Faust legend shows a Victorian-era stage conjurer, Li H'Sen Chang, to have effectively sold his soul to the scientist villain Magnus Greel, whom he believes to be the god Weng-Chiang, in exchange for improvements to his magic act. Greel is from the 51st century but is trapped in Victorian London, and must distill the life-essence of young women captured by Chang to stay alive. The Mephistopheles figure in the person of Greel garners the authorial critique, in part for exploiting the self-described "peasant" Chang's gullible religiosity to serve his evil ends. But despite Greel's apparent scientist status, the Doctor distances his portrayal from science by slandering Greel as a "scientific ignoramus", and his science

as “so-called technology”, “a technological cul-de-sac”, and “the twisted lunacy of a scientific dark age”: a contingent repertoire that marginalises Greel’s research as unscientific, compared to the Doctor’s normative empiricism. Unlike Sorenson and Solon, Greel has *never* been a part of the community of scientists, and does not act on science’s behalf.

Greel occupies a Victorian basement laboratory filled with bubbling concoctions and works alone on his dastardly research with a single assistant, all of which Weingart claims are emphasisers of antirationalist critique (Weingart, 2006). But *Doctor Who* is a science fiction series, and Greel is ostensibly from a technologically ‘advanced’ future. Thus, the ‘ye olde’ alchemical elements of setting and characterisation, far from symbolising the dangers of the new, reinforce the Doctor’s diagnosis that he is from a “scientific dark age”. In *The Brain of Morbius* too, Solon ‘degenerates’ from progressive, enlightened scientist to the ‘medieval backwardness’ of a criminal cult member living in a candlelit castle. In these gothic horror serials the denotative dialogue (Hall, 1980) effectively ‘resets’ the connotative significance of the ‘alchemist’ imagery.

Reinforcing this point is *The Masque of Mandragora* (1976), set in Renaissance Italy, in “the period between the dark ages of superstition and the dawn of the new reason”. The evil Hieronymous, court astrologer to a tyrant, carries all the hallmarks of an alchemist, with bubbling potions in glass flasks, an armillary sphere, and scholarly books. Yet Hieronymous is not a scientist, but is a superstitious “fraud” and ‘backward’ cult leader. His actions endanger a meeting of “scholars, artists, men of the new sciences” including Leonardo da Vinci, and the Doctor is concerned that this will throw society “back into a new dark age”, “interfere with Earth’s progress”, and turn humanity into “idle, mindless, useless sheep”. Accordingly, he defeats Hieronymous with science, leaving the court to the virtuous, skeptical, telescope-wielding, round-Earth-hypothesising scientist hero, Prince Giuliano. The gothic signifiers of the mad scientist trope are thus subverted to serve ideologies of rationalist progress and enlightenment.

Madness as incompatible with scientific reason

Implicit in the mad scientist trope is the idea that ‘madness’ is an inherent trait of scientist villains. Within the trope, madness is characterised as the product of unchecked

scientific obsession. For Tudor (1989) this variety of madness is a diagnostic trait of mad scientists in horror films.

In *Doctor Who*, this kind of science-driven madness can be found in a few serials (e.g. *The Power of the Daleks* (1966)), but madness is more often characterised as *incompatible* with science. In this the program draws on Enlightenment discourses of madness as the opposite of reason. 'Reason' and 'unreason' root two competing strands of modern Western philosophy, exemplified in Kantian objectivist universalism and Nietzschean antirationalist nihilism respectively. Foucault ([1961] 2009) differentiates "unreason" (an ahistorical antirationalist cultural streak) from "madness" (a pathology with a temporally definable cause, including madness caused by obsessive intellectualism) in Enlightenment philosophy, but he also claims their discursive interdependence as the diametric 'others' to reason. Both John Locke and Kant define madness as a fabrication of truth based on false, delusional premises that therefore unavoidably lead to error (Locke, 1690; Ross, 2000): a condition that would preclude effective participation in empiricist science.

In *Doctor Who*'s discourses of insanity, essentialised 'unreason' and the pathological disorder of 'madness' are co-constructed into the sensationalist-medical trope of the 'psychopath'. Psychopaths are *of essence* incompatible with rational science because they do not meet and have never met Western civilisation's standards of rational personhood. They may be equivalent to Tudor's (1989) horror movie 'psychotic' stereotype, defined by (usually non-scientist) villains who are pathologically ill, fundamentally unsound, and made insane by some essential, internal factor. For Tudor, the distinction between mad scientists and psychotics as the source of a film's core threat is so critical that he claims it as the basis for splitting the history of horror films into two eras, with psychotics becoming dominant from the 1960s. In *Doctor Who*, the psychopath trope applies equally to most 'mad scientists', rendering them mad not through scientific obsession but through mental disease.

Many scientist villains from the mid 1970s and beyond are marked by madness in *Doctor Who*. Solon has been called "mad" before and companion Sarah calls him "mad" and "insane" again. Greel is a "madman," "crazed maniac" and "murderous lunatic" in addition to subscribing to "the twisted lunacy of a scientific dark age." Zaroff (*The Underwater Menace* (1967)) is "mad as a hatter" while Klieg (*The Tomb of*

the Cybermen (1967)) is “crazy”, “out of his mind”, and the Doctor knew he was mad but just “wanted to make sure”. Gilbert M (*The Happiness Patrol* (1988)) is diagnosed as “a schizophrenic obsessive” by noble scientist Earl Sigma.

The two mid '70s scientist villains who are most explicitly pathologised as psychologically ill beyond doubt, however, are Xoanon (*The Face of Evil* (1977)) and Taren Capel (*The Robots of Death* (1977)).

Xoanon is not human, but rather is a crash-landed ship’s computer that “evolved into a living creature”. It is also a cruel tyrant and a scientist, manipulating the descendants of the ship’s humans in a eugenics experiment, controlling them with homicidal “phantoms” and forcing them to worship it as a god. While the Doctor condemns the eugenics experiment for its cruelty, his critique does not attribute blame to science. The blame falls squarely on Xoanon’s ‘abnormal’ psychology.

The explanation for Xoanon’s evil is this. When it became a living creature many years before, it ceased to function, being “in shock” from its “birth trauma”. The ship’s human occupants asked the Doctor — on his first (unseen) visit to this planet — to repair it. However, the Doctor failed to recognise that the computer was “alive”, and unwittingly allowed the infant Xoanon to take on his personality. Xoanon then developed its own personality as it matured, and now “has a split personality” and “schizophrenia”, according to the Doctor. Xoanon is, as the Doctor notes, “insane”.

The Doctor’s psychological references continue throughout the serial. In classic *Doctor Who* jumbled scientific technobabble that nonetheless carries the rhetorical authority of expertise, he demystifies the phantoms as “psi-tri projections from the dark side of Xoanon’s id”. Xoanon refuses to accept the Doctor’s diagnosis of its illness, has an identity crisis, and tries to kill the Doctor because he “contradicts what [Xoanon] thinks is real” and is “a threat to [Xoanon’s] world”. By the end of the serial Xoanon is cured and is able to reflect on its situation in a calm and rational manner: “I made a world in my own image. I made my people act out my torment. I made my madness reality.” The serial ends with a psychotherapy joke as Xoanon makes a couch materialise, invites the Doctor to sit in it, and then asks, “Tell me Doctor, where do you think I started to go wrong?”

Jokes notwithstanding, the Doctor and Xoanon both employ the empiricist repertoire of the psychoanalytic gaze to dissect the insane being and to render its actions necessarily contingent, the victim of a problematic childhood and a pathological inevitability. In being contingent, in harbouring delusions and paranoia that block its access to reason, Xoanon is thus incapable of engaging in rational science. The religiosity of its delusions emphasise its irrational nature. In contrast, Xoanon's former followers declare their newfound commitment to rationalist modernity by embracing the empirical: "With proof, you don't have to believe."

The Robots of Death reproduces these rhetorical strategies. Villain Taren Capel is labelled "a mad scientist, a very mad scientist" and "a happy little maniac" by the Doctor. He acquires the labels after modifying the robots his society depends upon to kill humans, thus initiating a robot revolution. Like Xoanon, he is a scientist villain with a problem childhood. He was raised by robots, and consequently as an adult believes he is a robot. In other words, he is literally mad.

While the Doctor does not subject him to the same barrage of psychobabble as Xoanon, he reinforces the empiricist psychological paradigm via his diagnosis of another character with the fictitious mental illness Grimwade's Syndrome, commonly known as robophobia. He explains that robots' lack of body language "undermines a certain type of personality, causes identity crisis, paranoia, sometimes even personality disintegration. Robophobia. At least that's Grimwade's theory." His rhetorical repertoire imbues his point with the certainty of empiricism: statements of fact, unqualified technical jargon, the added expertise of a colleague whose name garnishes a syndrome. In this context, the Doctor's use of the labels "mad" and "maniac" cannot lightly be interpreted as mere incidental slander. They render Taren Capel's motives as contingent, because his actions and beliefs do not follow "unproblematically and inescapably from the empirical characteristics of an impersonal natural world" (Gilbert and Mulkay, 1984, p. 56); rather, they follow from deeply rooted delusion.

Taren Capel and Xoanon both fit the 'psychopath' trope, since the source of their evil is inescapably pathological. These two serials then are not antirationalist critiques; if anything, they are anti-*irrationalist* in intention. Unlike literary traditions that characterise madness as a protest against rationalist modernity (Liebman, 1993), in *Doctor Who* madness is a problem to be fixed so that rationality may be restored.

Madness is particularly effective as a tool for pathologising a villain's motives as caused by something outside of science (and internal to the character) because it is not always visible. Taren Capel's madness does not become apparent until the end of his serial, when it is revealed that the rather uninteresting man we thought he was is actually a highly deluded person in believing he is a robot. In being revealed gradually or at the climax, madness is offered as an explanatory tool, a solution to the mystery, an underlying cause for the 'evil' science we witness.

Driving the point home are two reverse scenarios. Noble scientist Penley has a breakdown at the beginning of *The Ice Warriors* (1967) and abandons his responsibilities and his science, but after six episodes of soul searching, he reclaims his position as top scientist and saves the world with science, having been restored to rational sanity once more. This contrasts with Shelley's Frankenstein, who recovers from madness and then *abandons* science once back in his right mind. The Doctor too has a brief flirtation with insanity at the end of *The Armageddon Factor* (1979). Having acquired the all-powerful Key to Time, he is overcome by a fit of megalomania, frightening Romana. He snaps out of it, revealing it to be an act, and makes the point that if his insanity had not been an act, the universe would be in danger. For *Doctor Who*, sanity equates to rationality equates to science, while madness is as great a sin as superstition.

Characters unable to perform credible science

Two mid '70s examples illustrate *Doctor Who*'s use of a contingent repertoire to draw attention to villains' partiality, in order to undermine their scientific credibility. These villains are characterised as buffoons, bordering on insanity but at heart incompetent pretenders, who do not understand the normative rationalist conventions of technical competence and objectivity.

The first example is a pair of scientist villains from *Robot* (1974-5): Hilda Winters, director of the research institute 'Thinktank', and her assistant Jellicoe. Their former colleague, Professor Kettlewell, created an intelligent and powerful robot to replace humans in dangerous jobs, but fearing its potential use as a weapon, asked Winters to destroy it. She did not, and instead she and Jellicoe attempt to reprogram it to bypass its

prime directive not to harm humans, and use it to steal global superpowers' nuclear codes. Winters and Jellicoe are leading members of the fascistic Scientific Reform Society (SRS), an organisation committed to a "rationally ordered society" under autocratic rule by a self-appointed elite. They use the nuclear codes to blackmail world leaders into acceding to the SRS's demands. Under these criteria, Winters and Jellicoe seem strong candidates for Haynes' (2003) 'mad, bad, dangerous scientist' stereotype.

A contingent repertoire is employed throughout *Robot* to undermine their claims on the scientist identity though. Kettlewell himself sexistly dismisses the Director as "that woman Winters", not even acknowledging her title let alone her profession, and calls her and Jellicoe "incompetent nincompoops". This diagnosis is borne out in their failure to properly reprogram the robot, leading to its breakdown. The SRS is also cut down to size when Sarah and the Brigadier variously call it "a little tin-pot organisation", "a harmless bunch of cranks", one of "a number of fringe organisations", and "somewhere between the flying saucer people and the flat-Earthers". Far from being terrifying ultrarationalists, these villains are made to look small, stupid and ultimately the irrational opposite of their own rationalist ideals. They live and work outside of institutional science and are deluded about empirical reality. Via implicit reference to scientific norms (such as belief in a round Earth), they are rendered unrepresentative of science.

There is no villain in the history of *Doctor Who* who can match the level of nutterdom exhibited by millionaire botanist Harrison Chase though (*The Seeds of Doom* (1976)). *The Seeds of Doom* concerns an alien pod found in the Antarctic permafrost, which Chase illegally obtains to add to the collection of rare plants he keeps on his estate. The pod hatches, contaminating Chase's assistant botanist Keeler, who transforms into plant monster the Krynoid. Once fully grown, the Krynoid turns all other plants in the area homicidal and seeks to destroy all life on Earth. Chase dies trying to help the Krynoid succeed.

Chase reproduces 'inhuman researcher' (Haynes, 2003) coldly rationalist attitudes, particularly when it comes to Keeler's horrific transformation, saying that he was "a brilliant researcher. And a dedicated botanist. And now, properly nurtured, he can be of inestimable value to science", and that "the search for knowledge knows no boundaries. This is the most valuable study in plant biology ever made". But these core markers of

the ‘mad scientist’ are challenged by a number of rhetorical frames that powerfully contrast Chase with normative science.

Chase essentially marginalises himself, because the primary signifier of the contingent nature of his science is his unusual attitude to plants. Chase lacks the dispassionate, objectivist eye of the rational scientist: not only is he overly personally invested in his subject, but he possesses an unconventional belief in plant emotions and sentience. In his first scene, Chase protests against bonsai, declaring it to be “mutilation and torture”. He treats the plants at his research institute like people: “Here we treat our green friends as patients. If they’re puny, we build them up. If they’re sick we give them succour.” Chase talks to his plants, and plays them his own musical compositions in his greenhouse — his “green cathedral” — including “The Hymn of the Plants” and “Floriana Requiem”, which doubly marginalise his science through anthropomorphism and religious overtones. After an encounter with the Krynoid, Chase lies prostrate on the ground, whispering, “Yes. Yes. The plants must win. It will be a new world, silent and beautiful.”

Chase finally appears to go mad, believing he himself is a plant, and claiming, “animals have ruled this planet for millions of years - now it is our turn”, “animals are the enemy”, and “all plant eaters must die”. In the final episode, before punching companion Sarah unconscious and putting her in his compost machine, he tells her, “You and your kind are nothing but parasites. You’re dependent upon us for the air you breathe and the food you eat. We have only one use for you.”

Chase exemplifies the “personal inclinations” that rhetorically signify contingent science (Gilbert and Mulkay, 1984). His data are aesthetics and delusions of persecution, rather than empirical ‘fact’. His marginalisation is enhanced by the socially normative attitudes of Sarah — “I’ve heard of flower power but that is ridiculous” — plus allegations from the Doctor that he is a “madman” or possibly “possessed”. Chase’s views could yet be characterised as minority science, being reminiscent of the contemporaneous minority science of Tompkins and Bird (1974), but even if so, the rhetorical frame suggests a normative critique of the minority field rather than of science *qua* science.

This section has identified three rhetorical strategies used to challenge scientist villains' claims on the scientist identity; strategies that in doing this undermine the mad scientist trope. The examples show that even where stereotypical mad scientist signifiers are present in a text — not the least of which are gothic horror imagery, tributes to classic 'mad scientist' texts, accusations of insanity, and character ambitions consistent with scientist villain clichés — their intended meanings do not necessarily conform to expectations based on the trope. These signifiers can be cunningly subverted to market any number of messages about science, including, in this case, a powerfully pro-science statement. Far from being the "natural opponent" of science (Weingart, 2006), these particular scientist villain characters inadvertently function as science's staunchest defenders. They are scientism's fifth column, implanted within the 'mad scientist' role of a text only to bring it down from the inside, to serve a secular rationalist end consistent with Western Enlightenment values. Although the arguments of Toumey and Weingart remain pertinent in many cases (e.g. below), these examples suggest that caution must be exercised, the complex interplay of multiple textual elements considered, and assumptions based on the mad scientist trope challenged, when investigating scientist villains' significance for science.

These mid '70s serials are obvious examples of texts that undermine the mad scientist trope, but not isolated ones. The next section shows how significant differences between scientist characters' ideological functions in *Doctor Who* — embodying critique, uncertainty, or defence of science — can be classified and systematically analysed using Haynes' (2003) typology of scientist stereotypes.

Ambivalence and irrelevance in broad categories of scientist character

As noted in Chapter 3, Haynes (2003) defines seven scientist stereotypes that recur throughout Western literature. The 189 prominent scientist characters in *Doctor Who* may be classified into these categories relatively uncontroversially (Table 7), although none stand out as fitting the 'scientist adventurer' stereotype. I have classified all the 'goodie' scientist characters as noble scientists because they use their science with integrity to benefit humanity. Haynes identifies five 'baddie' scientist stereotypes: evil alchemist, mad scientist, inhuman researcher, helpless scientist and foolish scientist, and I have fit most of the 121 prominent scientist villains in *Doctor Who* to these using

Table 7. Main stereotype of the scientist characters listed in Tables 2-5. Types modified from Haynes (2003). In the indicative character counts, the word 'unique' signifies the number of characters unique to that decade for that category. For example, Davros and The Master are listed among the 'mad scientists' in the 1970s, 1980s and 2000s, but in the indicative counts are only counted for their first appearance, among the 1970s characters. The indicative count for the 1980s mad scientists is therefore '5 unique', even though there are in fact seven characters in that category.

Scientist stereotype	1960s (50 serials)	1970s (58 serials)	1980s (50 serials)	2000s (43 serials)
Evil alchemists	Lesterson	Quinn	Pangol	Krillitanes
(17)	Maxtible (2)	Lawrence	Omega	Lumic
		Stahlman	Mawdryn & friends	Hartman & Torchwood crew
		Omega	Dastari (3 unique)	Lazarus (4)
		Sorenson		
		Magnus Greel		
		Stael		
		Pirate Queen (8)		
Mad scientists	Meddling Monk	The Master	Meglos	Cassandra
(22)	Zaroff	Winters & Jellicoe	Aukon	Carrionites
	Kaftan & Klieg	Davros	The Master	Cult of Skaro
	Salamander	Kraals	Monarch	The Master
	Vaughn (5)	Solon	Davros	Max Capricorn
		Eldrad	Sharaz Jek	Davros (4 unique)
		Taren Capel	Josiah Smith (5 unique)	
		Scaroth (8)		
Inhuman researchers	Dalek scientists	Taltalian	Dexeter	Van Statten
(42)	Locusta	Lennox	Terileptil	Sisters of Plenitude
	Moroks	Kettering	Solow	Foster (3)
	Senta	IMC	Quillam	
	Cybermen	Azal	The Rani	
	Janley	Jaeger	Chessene	
	Damon	Linx	Borad	
	Macra	Whitaker & Butler	Crozier	
	Dominators	Styre	Doland	
	Gregory	Chase	Gilbert M	
	Krotons	Xoanon	Captain Cook	
	Alien Scientist (12)	Delta Magna crew	Light	
		Drax	Judson (13)	
		Tryst (14)		

cont'd...

Table 7. cont'd

Helpless scientists (21)	Smithers Brett & Krimpton Arden Viner & Parry Professor Travers (5)	Winser & Hardiman Horner Ingram & Stu Stevens Kettlewell Marcus Scarman Stevenson Keeler Fendelman Kerensky (10)	Ambril Lasky Mathematician (3)	*Impossible Planet* crew *42* crew Rattigan (3)
Scientist victims (12)	Waterfield (1)	Dawson Laurence Scarman Ransome Lamia (4)	George Cranleigh Maddox Kiston Romulus & Remus Azmael (5)	Magpie Docherty (2)
Foolish scientists (7)	Drahvins Garrett & Clent Dulcians (3)	Engineers (1)	Hardin Hayter (2)	Hobbes (1)
Noble scientists (68)	Artamon Sensorite scientists Farrow Dortmun Rills Preslin Barclay & base crew Valmar *Moonbase* crew Penley Anne Travers Harris Megan Jones Corwyn Wheel crew Watkins UNIT Beta Eldred Kelly (20)	Medical staff Cornish Williams Summers Holden Sondergaard Cliff Jones Rubeish Vira Ronson & Gharman Giuliano Watson Litefoot Marius Colby Rodan Binro Rumford (18)	Caris & Deedrix Kalmar Tremas Monitor Mergrave Todd Kyle Chela & Dojjen Garm Range & Norna Laird Styles George Stephenson Bruchner Jensen & Williams Earl Sigma Warmsley (17)	Sato Constantine Hospital staff Hame Redfern Yana Chan-Tho Milligan Ryder River Song Dee Dee Magambo Jackson (13)
Total	48	63	48 unique	30 unique

diagnostic traits as follows:

Evil alchemists seek forbidden gifts — unlimited energy sources, immortality, omniscience — through science and technology.

Mad scientists megalomaniacally seek power or vengeance, with scientific knowledge as their means but not their end.

Inhuman researchers perform scientific research, technological production or resource exploitation in cruel and ethically questionable ways, enabled and encouraged by cold rationality and lack of emotional commitments.

Helpless scientists naively unleash unearthly horrors through their well-intentioned meddling. They differ from evil alchemists, mad scientists and inhuman researchers because they have a 'good' conscience and generally regret the suffering they cause. Under Haynes' (2003) definition, helpless scientists refuse to accept responsibility for the disasters they unleash, but the *Doctor Who* characters I have placed in this category are more sympathetic.

Foolish scientists are neither wholly 'baddies' nor 'goodies'. Their science does not unleash disaster because it is ineffectual and trivial, but trouble arises through their failure to adopt effectual science instead.

For a few scientist villains not fitting these categories, I have established the category *scientist victims*. These characters are not free to make sound ethical choices, so swing between baddie and goodie status. They are almost always controlled by more powerful others, often scientist villains themselves. For example, engineer Magpie (*The Idiot's Lantern* (2006)) produces dangerous technologies under torturous coercion from a parasitic alien, and physicist Docherty (*Utopia* (2007)), living under the tyrannical reign of mad scientist the Master, betrays the resistance because the Master holds her son captive.

These six villain stereotypes generally serve different functions with respect to embodying debates about science, at least as they apply to *Doctor Who* characters. Two main factors determine this function. The first is the 'agenda' of the character: what

they want, what moral dilemma they face, and what role science plays in this. The example of Solon shows that a non-science agenda can shift a text's focus towards non-science issues, rendering it largely irrelevant to debates about science. The second factor is the mitigating influence of other scientist characters, particularly 'goodie' scientists, and most importantly, the Doctor. Since the Doctor is usually the ultimate determinant of a serial's moral message, his commentary on the villain's science, and his actions towards it, frames its meaning, as we have seen with Sorenson, Solon and Greel. The Doctor is a shape-shifter, evolving over the course of 45 years and changing from one serial to the next, so while sometimes playing the noble scientist who embodies the great and positive potentials of science and rational secularism, at other times he plays the humanist hero, revelling in the irrational beauty of the human experience against utilitarian ultra-rationalism. The effect of this is that sometimes the force that defeats or trumps scientist villains is more effective, more intelligent 'goodie' science, adding up to a net message of support for science in such serials. At other times it is humanism, not noble science, that defeats them, which can mean these serials contribute net antiscience critique.

These two factors differ in importance for the different stereotypes.

Both mad scientists and scientist victims have agendas outside of science. They mostly do not embody debates about science because their ethical problems concern issues of power more generally. For most mad scientists science is merely the means to establishing political power for themselves or more powerful others, or for wreaking karmic revenge.[42] For some, their primary aesthetic interest is as semi-supernatural or criminal villains, even though they employ the tools of science: Aukon is a vampire (*State of Decay* (1980)), the Carrionites are witches (*The Shakespeare Code* (2007)), Jek is a drug dealer (*The Caves of Androzani* (1984)) and Capricorn a corrupt corporate CEO (*Voyage of the Damned* (2007)). Evil alchemist Stael (*Image of the Fendahl* (1977)) may also fit this category since he is the pagan leader of a local coven who wishes to become a god. These characters are thus little different from non-scientist megalomaniacs in *Doctor Who*. It is therefore inappropriate to claim them as the embodiment of antiscience critique. Likewise, for scientist victims it is never their science under scrutiny, but their moral strength as human beings. The moral dilemmas

[42] Establish political power for themselves: Zaroff, Salamander, Vaughn, the Master, Winters & Jellicoe, Kraals, Eldrad, Meglos, Monarch, Cassandra, Carrionites. Establish power for more powerful others: Solon, Aukon. Wreak karmic revenge: Taren Capel, Scaroth, Sharaz Jek, Max Capricorn.

they face — about resisting evil or complying with it when being threatened with the suffering of loved ones, subjected to torture or mind control, or manipulated by an object of desire — are dilemmas for all people.[43] The scientist professions of these characters are incidental, merely convenient for the plot.

There are exceptions among the mad scientists. Davros, creator of the villainous Daleks, and the Cult of Skaro, a Dalek elite, seek supremacy for their species, but they try to achieve this through genetically engineering the Daleks to be more ruthless (*Genesis of the Daleks* (1975) and *Daleks in Manhattan* (2007) respectively). Since power is coveted for the products of their science, these villains' status as scientists is also important. It is therefore arguable that these mad scientists are correctly considered to embody critiques of science, at least for those serials in which they act in a scientist's role, but probably not for the serials in which they appear as more generic megalomaniacal villains (e.g. *Resurrection of the Daleks* (1984) and *Doomsday* (2006)).

Helpless scientists tend to embody ambivalence towards science. Their intentions are often altruistic, aiming to alleviate widespread shortage and suffering. Where they are driven by reckless curiosity, they at least later repent if given the chance to do so.[44] While they are still culpable as scientists as discussed in the final section of this chapter, it is important to note that they are almost always trumped by competent goodie scientists, and this is what creates an air of ambivalence about science (or even a net message of support for science) within their serials. As noted, the goodie scientist who most frequently discursively rescues science's reputation is the Doctor, but other noble scientists include government scientist Farrow discovering the disastrous side effects of naïve idealist Smithers' agricultural insecticide (*Planet of Giants*), boffin Anne Travers reprogramming the homicidal robot products of her father Professor Travers' meddling (*The Web of Fear* (1968)), and hippy biotechnologist Cliff Jones detoxifying the poisons bred from Stevens' industrial science (*The Green Death* (1973)).

Foolish scientists' intentions may likewise be benign or ill, but the ineffectual nature of their science means that like the 1970s characters discussed in the first section of this chapter, they are not culpable as scientists (discussed separately below).

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[43] Threatened with the suffering of loved ones: Waterfield, Laurence Scarman, Romulus & Remus, Azmael, Docherty. Subjected to torture or mind control: Ransome, George Cranleigh, Maddox, Kiston, Magpie. Manipulated by an object of desire: Dawson, Lamia.

[44] Aim to alleviate shortage and suffering: Smithers, Brett & Krimpton, Winser & Hardiman, Kettlewell, Kerensky, Lasky. Driven by reckless curiosity: Arden, Viner & Parry, Professor Travers, Fendelman, *Impossible Planet* crew.

Evil alchemists and inhuman researchers are more likely to embody antiscience critiques. By definition they have agendas to pursue their scientific goals at any cost. Many are identified with establishment science and endorsed by establishment political regimes. For this reason, the scientific establishment is generally represented as accountable for the catastrophic consequences or routine violence of the science, and this is discussed in the next section.

Sorenson is exceptional among evil alchemists in getting a second chance; his fellows are almost always defeated by reified humanism in the form of the inherent impossibility and irresponsibility of their ambitions. These characters demonstrate the limits of 'appropriate' research; they are metaphorical protests against science's designs on omniscience. Aside from Greel and to a lesser extent Stael, none of them don the traditional garb of medieval alchemists: they work with state-of-the-art technology and are located within present or future science programs, reinforcing their status as allegories for current science ethics debates. Even Maxtible, although from the Victorian era, collaborates with the Daleks so that he can acquire futuristic technology to achieve his alchemical ambitions (*The Evil of the Daleks* (1967)). The inhuman researchers universally act without regard for normative ethical standards. They may experiment on sentient beings, treat people or ecosystems as dispensible research consumables, or more generally have a callous attitude towards suffering caused by their work.[45]

In opposing evil alchemist and inhuman researcher villains, the Doctor frequently plays humanist not scientist, even if he uses his technical knowledge. For example, in *New Earth* (2006), his advanced pharmaceutical skills heal the test-humans subjected to inhuman experimentation, but in doing so he acts as a rogue activist against a large, state-of-the-art medical institution and its reputable medical staff, the Sisters of Plenitude. Notably, he does not propose a better way to approach medical research, in contrast to *Planet of Evil*, in which he gives Sorenson an alternative technology. By withholding from them his scientific wisdom and knowledge — usually so omniscient — and simply criticising, he leaves no way forward for science. The Sisters thus remain its symbolic representatives and loci of critique.

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[45] Experiment on sentient beings: Senta, Gregory, Alien Scientist, Styre, Dexeter, Borad, Crozier, Van Statten. Treat people or ecosystems as dispensible: Azal, the Interplanetary Mining Corporation, Doland, Light. Callous attitude towards suffering: Cybermen, Janley, Damon, Lennox, Kettering, Jaeger, Linx, Whitaker & Butler, Tryst, Quillam, Captain Cook, Judson.

In *The Mark of the Rani* (1985) the Doctor again distances himself from establishment science, but in this case the presence of other noble scientists mitigates the critique. The main villain is the Rani, who harvests brain chemicals for her research from coal miners in the 1820s, turning them into insane, destructive louts. The Doctor criticises science's reductionist utilitarianism as embodied by the Rani: "Like many scientists, I'm afraid the Rani simply sees us as walking heaps of chemicals. There's no place for the soul in her scheme of things." Viewed from this angle, the serial looks like a straightforward antirationalist critique, with even the usually secular Doctor endorsing the existence of 'the soul'.

Nearby, however, dwells noble scientist George Stephenson, real-life railway engineer, who is to host a conference for "many of the greatest practical talents the human race has ever produced", including Faraday, Huxley, Telford, Davey and Brunel. All these people clearly belong to the science establishment just like the Rani, but they are altogether positive characters. The Doctor tells companion Peri that the "twentieth century would be a much sorrier place" without their work, and Peri herself emulates noble science with her medicinal botanical skills. Stephenson is jovial, humble, altruistic and immune to class prejudice. At the same time, dialogue is careful not to criticise the Luddite movement which protested industrialisation, Peri speaks about biodiversity loss due to industrial agriculture, and the Rani makes logically valid points about humans' cruel treatment of 'lesser' species as a parallel to her own exploitative research. In *The Mark of the Rani*, written by Pip and Jane Baker who also authored the ambivalent *Time and the Rani* (Chapter 5), science is asked to take responsibility for all its progeny, good, bad and ambiguous. The presence of multiple scientist characters — and their mutability in being neither wholly 'good' nor 'bad' — highlights the contradictory contributions of science to society and the resultant social ambivalence towards it, as found by Locke (2005).

All of this illustrates the utility of Haynes' classification for understanding authorial intention in terms of attitudes towards science. But the differences between scientist villains in *Doctor Who* are not solely a matter of which scientist stereotype they belong to.

As shown in the previous section, 'madness' marks a character as unrepresentative of science and attributes the cause of villainy to a non-science factor. Other character traits

can pathologise the motives of a villain in a similar way. 'Criminality' is one such trait, pathologising the motives of the Terileptil scientist, who is an alien prison escapee (*The Visitation* (1982)), and Taltalian (*The Ambassadors of Death* (1970)) and Solow (*Warriors of the Deep* (1984)), both foreign agents who act treasonably. Their criminal status 'explains' their villainy, deflecting moral culpability away from science. Exceptions to this are scientists shown to be criminally negligent in breaching legislated ethical standards (Lennox (*The Ambassadors of Death*), Dastari (*The Two Doctors* (1985)), the Borad (*Timelash* (1985)), Lazarus (*The Lazarus Experiment* (2007))), since their actions raise questions about the ineffectual nature of science ethics. To some extent the Doctor's condemnation of their breaches functions to redeem science as intrinsically ethical as with Sorenson, but unlike Sorenson, these characters do not lose their 'reason' along with their ethics. Rather, they embody the rogue element of unregulated, private scientific ambition that Weingart (2006) characterises as a typical manifestation of an antiscience critique.

The motivations of three other scientist characters are not quite pathologised, but their class orientations to their scientific work shift responsibility away from their science and onto their non-scientific employers. Locusta (*The Romans* (1965)) normalises her inhuman science as court poisoner for the Emperor Nero. Her mundane disinterest in her work — it is just a job and someone will be employed to do it — together with the humour of the story shifts the focus from science to the vagaries of Roman culture. The work of Drax (*The Armageddon Factor*) and Foster (*Partners in Crime* (2008)) is also ultimately controlled by someone else to meet non-scientific ends, so it is unlikely that these characters were intended to impugn science.

A number of characters are pathologised by the fact that their biology has been shifted far from what is 'natural'. Like Sorenson's "antiman", they are the evil monstrous rather than the evil rational. Mawdryn and his colleagues (*Mawdryn Undead* (1983)) have been hideously disfigured by their flawed science, and seek merely to be restored to normality. The Dalek scientists (*The Daleks* (1963-4)) are similarly looking for a solution to the radiation that has mutated them beyond recognition. Omega (*The Three Doctors* (1972-3), *Arc of Infinity* (1983)), having been banished to an antimatter universe, has essentially ceased to exist in a physical sense. The Pirate Queen (*The Pirate Planet* (1978)) has also become a shadowy, half-existent figure who is pointlessly trying to stave off death by consuming worlds. To a significant extent it is

the desperate biological circumstances these characters endure that explains their villainy, rather than their scientific capacity as such. Chessene (*The Two Doctors*) is also a slave to her biology, being a genetically augmented genius who was once an unintelligent creature of instinct, and the 'inevitable' emergence of her 'bestial' nature relieves science of responsibility for her actions. (However, the scientist who augmented her, Dastari, retains culpability since his actions were borne of scientific rationality not bestial instinct.) Similarly, the Macra (*The Macra Terror* (1967)) are non-speaking, non-humanoid creatures of unidentifiable species — even the Doctor cannot classify them, saying only "I don't know [what they are]. But you must fight them" — whose use of oppressive technology to exploit a human colony is attributed to their monstrous nature:

> Doctor: They're like germs in the human body. They've got into the body of this colony. They're living as parasites.
> Polly: You make it sound like a disease.
> Doctor: Polly, that's what I think they are.

The converse of this enslavement to biology is three prominent villains who are dependent on life-supporting wheelchairs to survive (Davros, Max Capricorn, Lumic (*Rise of the Cybermen* (2006))). These characters vary in whether they embody antiscience critique. Capricorn is most obviously driven by motivations outside of science, since he stays alive only to bankrupt the board of his former company and his use of science is relatively incidental. His wheelchair is then merely a grotesque visual marker of his obsessiveness rather than a signifier of science and technology as such. As noted above, Davros also becomes merely obsessed with power in his later stories, so remains a locus of debates about science only within his first story, *Genesis of the Daleks*. This contrasts with Toumey's thesis that mad scientists compound the critique the more they appear: in Davros's case, his sequels render him more and more a cliché of himself, making him less and less interesting and taking him further away from science.

Both the *Genesis* Davros and Lumic are clear examples of antiscience critique though. Their wheelchair-dependence is explicitly linked to their scientific creations, which in both cases is life-support technology for their people: the Daleks' outer casing and the Cybermen's cyber suits. This link implies an unnaturalness about their own

technological dependence, which in turn suggests suspect motives: that they are afraid to suffer and die in accordance with the Romantic humanist imperative. The Doctor's remarks about these characters in each serial, although spoken 31 years apart, indicate that both are intended to represent misdirected genius, the 'bad' side of science which contrasts with a humanist commitment:

> Undoubtedly, Davros has one of the finest scientific minds in existence. But he has a fanatical desire to perpetuate himself through his machines. He works without conscience, without soul, without pity, and his machines are equally devoid of these qualities.

> Oh, Lumic, you're a clever man. I'd call you a genius except I'm in the room. But everything you invented, you did to fight your sickness. And that's brilliant. That is so human. But once you get rid of sickness and mortality, then what's there to strive for? Eh? The Cybermen won't advance, you'll just stop. You'll stay like this forever. A metal Earth, with metal men and metal faults. Lacking the one thing that makes this planet so alive - people! Ordinary, stupid, brilliant people.

The latter quote is an example of antiscience critique taken to a fascistic level, moving away from the democratisation of science with the autocratic imposition of an irrationalist ideology on the human race. Lumic's democratic right to access technology to help him deal with his illness is denied here. The Doctor effectively forbids sick people from striving to eliminate their pain, suffering and untimely deaths because it would take them too far from the 'natural', "ordinary" human condition that "makes this planet so alive". He endorses their striving but not their succeeding. This is an elitist argument placing ideology (puritanical humanism) before material need (the alleviation of death and suffering). Its logical conclusion is that the billions of people who currently have tuberculosis, HIV/AIDS, malaria and so on should enjoy the essential humanness of tilting at corporate pharmaceutical or inequitable global governance windmills while they lie dying.

This example provides a neat segue into my discussion of the critiques that *Doctor Who* does make of science. Before proceeding to that though, I discuss the complex case of the foolish scientists and the ideologies of science their representations embody.

Foolish scientists, ineffectual science and gender non-conformity

Foolish scientists by definition are not competent scientists. The presence of the Doctor or other noble scientists alongside them in all cases counters any potential critique of science they may embody. In addition, the particular way in which foolish scientists are characterised in *Doctor Who* is interesting because it links normative notions of gender to effectual science by drawing upon and reinforcing a masculinist, individualist ideal of 'the scientist'. All but one of the foolish scientists in *Doctor Who* exhibit gender non-conformity in one way or another. Gender non-conformity is an affront to a model of personhood and humanity that came into ascendancy in the Enlightenment (Schiebinger, 1989) premised on the assumptions (a) that there are two different and complementary sexes (female and male), not multiple sexes or no sexes or a continuum of possible sexes despite what competing biological and cultural models suggest (Fausto-Sterling, 2000; Herdt, 1994; Hird, 2004; Schiebinger, 1989), and (b) that differences between the sexes are biologically determined by 'natural law'. Characters who stray outside of normative gender conventions and cross these sacred boundaries challenge basic cultural beliefs. In *Doctor Who* they therefore signify a deep-seated 'problem' at the base of their particular societies that goes hand-in-hand with poor science.

Implicit in the dichotomous model of sex is the natural superiority of men both in the sciences and as complete, independent and individual human beings. This privileging of masculinity reflects an inherent asymmetry in Enlightenment conceptions of sex from Kant to Wollstonecraft, in which "a woman makes no secret of her wish that she were a man, but [...] no man would ever want to be a woman" (Schiebinger, 1989, p. 230). Although female scientists may aspire to be as powerful and competent as men, men cannot credibly aspire to feminine qualities because where peoples or cultures threaten the masculinist ideal, science cannot succeed. Accordingly, the gender non-conformity I discuss in this section is not the kind exhibited by women who assert themselves or function in traditionally male scientist roles, since they 'understandably' aspire to a masculinist, individualist norm. The gender non-conformity in question mostly involves threats to masculinity and in some cases includes men who are subordinate to powerful women.

Running through the list of foolish scientists (Table 7, p. 196), this becomes clear. The Drahvins (*Galaxy 4* (1965)) are a predominantly female, genetically engineered race of

warriors. They have all but dispensed with men because men "have no function". We do not meet any male Drahvins, only a ship's crew of more or less identical women. Their broken spaceship is made of low quality metal and they cannot repair it, demonstrating their poor scientific capacity. Problematically as far as *Doctor Who* is concerned, their social ideology of technocratic utilitarianism has resulted in their simultaneous rejection of three 'fundamental' human phenomena: 'natural' sex roles (notably women as breeders), the 'natural' creativity required to develop quality science under an Enlightenment model, and the 'natural' importance of men themselves. The Drahvins are ultimately exterminated as a result of their shortcomings.

Jane Garrett is the techno-competent woman in charge of 'the computer' in *The Ice Warriors*, which, as discussed in Chapter 5, fails to be effective in its task to save humanity from catastrophe. The dependence of Garrett and her male boss Clent on the computer represents a failure to rise to the Enlightenment individualist challenge. Through the disparaging words of individualists Penley and Walters, blame for the Earth's problems rests squarely on people like Garrett and Clent who cannot think for themselves, and so grotesquely usurp the masculinist paradigm's rightful place as the governing philosophy of society. Garrett is not unfeminine in physical appearance, but she is relatively emotionless, directing all her passions towards protecting and defending the computer, thus rendering humanity still more helpless and dependent. Clent has a limp and walks with a stick, emphasising his weakness, dependence, and failed humanity: his failure to meet normative standards of manhood. Countering this dependency and weakness is the fully human male scientist Penley, who overrides the computer and saves the day.

The Dulcians (*The Dominators* (1968)) possess uninquiring science: they refuse to question or examine apparent 'facts', clearly misinterpreting them and so drawing absurd conclusions. All three Dulcian scientists, including two men, wear frilly, girlish frocks, thus equating effete science with effeminacy. In their case, the fundamental social problem that has resulted in both gender non-conformity and ineffectual science is an ideology of pacifism. Their ancestors rejected scientific inquiry because of its connection with weapons, and this pacifism has (apparently) also left both men and women effeminate. It has also rendered them vulnerable to invasion by the hyper-masculine, broad-shouldered and leather-clad Dominators who retain effective science and technology. The Dulcians are saved only by the rational individualism of the Doctor

and Zoe, and in the final stroke by the unsophisticated reason of the 'natural man' Jamie.

The engineers in *The Creature from the Pit* (1979) are the representatives of science on the 'backward' planet Chloris. When investigating an interstellar capsule, the Doctor mocks their conclusion that it is the remains of an ancient temple, and ironically comments, "To be fair I had a couple of instruments they didn't have access to like a teaspoon and an open mind." Notably, these male scientists willingly work for a female autocrat, Adrasta, who applies matriarchal rule, for example her second in command assumes that Romana is the Doctor's commander. Adrasta puts one of the engineers to death for his ineffectual science, with only the Doctor to defend him, saying, "He may be a bit of an idiot, but at least he's a conscientious idiot." This state of affairs renders the engineers' masculinity suspect and shows their propensity for individualist assertion to be non-existent, thus 'explaining' their ineffectual science. Also by writer David Fisher is *The Leisure Hive* (1980), featuring male foolish scientist Hardin, who has faked his experiments under pressure from his funder in order to impress a powerful woman, his lover Mena. Interestingly, Fisher's *The Stones of Blood* (1978) features noble scientist Professor Emilia Rumford, an elderly 1970s archaeologist who exhibits much scientific intelligence, a nutty professor-like fixation on academic disputes, and a heroic capacity to apply skills in physics and engineering effectively in the field. She is also marked by her own brand of gender non-conformity, carrying many implicitly lesbian traits (Nyder, 2006). Most obviously, she is rather butch in clothing and hairstyle, and has an unusually close domestic relationship with a woman who is linked in dialogue to famous British lesbian Violet Trefusis. Rumford's credible science in the face of this challenge to heteronormativity confirms that it is not gender-bending itself that is characterised as problematic for science, but only that which challenges masculinist individualism. Rumford's conformity to scientific, individualist and perhaps even masculinist norms — and, critically, her lack of material power over men — allows her to maintain scientific credibility.

Foolish scientist Professor Hayter (*Time-Flight* (1982)) is only ineffectual by virtue of being out of his own place and time, so is not presented as being scientifically incompetent as such. The theories of Professor Winfold Hobbes (*Midnight* (2008)), on the other hand, are found to be profoundly and dangerously incorrect, particularly by comparison to the sound reasoning of his student Dee Dee. Hobbes' gender conformity

is not under question, so he may be an exception to this pattern, and as the only new series foolish scientist this may reflect a shift in the program's underlying philosophy.[46] What might be suspect about Hobbes, though, is his choice of travelling companion. That a middle aged professor would choose to travel with a young, attractive, female student and then mostly exploit her for "fetching and carrying", neither treating her collegially as an equal nor even exploiting her sexually, raises implicit questions about his masculinity, such as whether he is having a mid-life crisis and requires Dee Dee to bolster his ego. This dependence and emotional weakness in itself would seem to taint his ability to conform to a masculinist individualist ideal.

In addition to these foolish scientists, mad scientists Winters and Jellicoe similarly exhibit ineffectual science as discussed above. This pair disrupt gender normativity through Winters' butchness and Jellicoe's slight flouncy campness and his subordinate status to Winters. Winters' butchness comes through in the first instance via her appearance, with sensible low heels, an unflattering three piece skirt-suit, 'coke bottle' glasses, and hair over her face. This contrasts with companion Sarah who, unusually for her, wears high heels, jewelry, a handbag, a redundant hat, and a feminine mauve two piece skirt and jacket. From her first episode in *The Time Warrior* (1973-4), Sarah was characterised as a dogged and uncompromising feminist, challenging the Doctor's sexism and that of everyone around her, including that of a male member of the SRS in *Robot*, who sexistly challenges Sarah's usual clothing of trousers. Yet in interactions with Winters, Sarah loses this political hardness and adopts 'normal' sexist fallibility, primarily by assuming that Jellicoe is the Director and Winters his assistant. Winters rightly reprimands Sarah for this, but in doing so, by placing herself further towards gender non-conformity *even than Sarah*, and assisted by the contrast in their clothing, she carves for herself the role of ridiculous extremist. Rather than conforming to masculinist individualism by succeeding against the odds in a 'man's world', 'ultrafeminist' Winters becomes a threat to masculinism, perhaps seeking to undermine it. That Jellicoe fails to resist her power and to see how ineffectual her science is proves that both of them have failed to become properly human according to a masculinist individualist model.

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[46] There is certainly an acceptance of gender variations in the new series, as evidenced in the transgendered scientist villain Cassandra (*The End of the World* (2005) and *New Earth* (2006)). Her transgendered status is not dwelt upon though, only being mentioned once in passing by Cassandra herself, and in all other respects Cassandra conforms to highly stereotypically feminine traits. Her transgendered status may simply 'disguise' a sexist cliché, as has been noted for at least one other fictional work featuring a transgendered female character (Ayers, 1997).

Finally, two inhuman researcher characters border on fitting this hypothesis with their improperly subjective science and implied queerness. I discussed Harrison Chase's subjective science above, but I did not mention his campery *par excellence*: he has been described as "Mr Humphries with psychotic tendencies" (Nyder, 2006). Since the 19th century, Chase's field of botany has been considered an "unmanly" specialisation for "ladies and effeminate youths" (Schiebinger, 1989, p. 241), and Chase's particular fetishisation of the aesthetic qualities of plants links his inability to be objective with his utter non-conformity to normative masculinity. Gilbert M (*The Happiness Patrol*), too, is a camp scientist whose science is a bizarre affront to masculinist norms. His scientific achievement is the Kandy Man, a sadistic android made from a metal endoskeleton covered in sweets (his abdomen is a licorice allsort, his feet are marshmallows, etc), who functions as state executioner for the female autocrat Helen A, a deliberate parody of Margaret Thatcher (Cornell et al., 1995; Howe and Walker, 2003). The Kandy Man kills people with 'fondant surprise', a sweet, pink, strawberry flavoured liquid so delicious that it is lethal. Gilbert M's science is not ineffectual, but it is strange, seemingly motivated by aesthetics rather than scientific objectivity just like Chase's science. Like Chase, Gilbert M is literally mad, and it may be that in these two characters, madness, effeminacy and scientific abnormality collide in what decidedly does not conform to an Enlightenment ideal of masculinist personhood.

In all these examples, it is the dominance of the female/feminine/effeminate over the masculine that is linked to flawed science. The punchline is that if the female/feminine/effeminate should ever rise to ascendancy over masculinism, humanity should start worrying about the state of its science. In essence, this is an assertion of rationalism because it excludes foolish scientists from serious consideration in debates about science *on multiple culturally normative grounds*, not merely the fact that they cannot perform credible science.

In this section and the last I have offered what I interpret to be the authorially intended ideological functions of particular scientist villains. I have argued that elements of characterisation and the rhetorical framing of core issues can determine whether a character may be legitimately named as a locus of debates about science, and whether the terms of such a debate where it is present are strongly pro-science rather than antiscience.

Of the list in Table 7 (p. 196), most of the mad scientists, all the foolish and victim scientists, about a third of the evil alchemists, and approximately one quarter of the inhuman researchers are portrayed in such a way as to render them unrepresentative of science, if my interpretation of authorial intention is accepted (Table 8a).

From this count, about half of the scientist villains may safely be considered the embodiments of antiscience critique (Table 8b). Such a list suggests there is a large number of *Doctor Who* serials representing dissent to aspects of science on the part of the program's authors. But if these characters are intended to function as critiques of science, what exactly is that basis of the critique? That is the subject of the next section.

Who is left? *Doctor Who*'s critiques of science through scientist villains

Antiscience critiques from the early decades of *Doctor Who* were mostly concerned with the material problems of an earthly science, either inhuman cruelty or helpless science out of control (Figure 5a, Table 8b). The morally ambivalent helpless scientists gradually rose to prominence during the 1970s, displacing the more dastardly inhuman researchers to some extent, especially in the Tom Baker era (Figure 5b). This correlates with the program's increasing scientism and may be a further indication of a growing unwillingness in that decade to condemn science too harshly. After a noticeable dip in the Davison era, in which critiquing science all but stopped, inhuman researchers regained dominance in the mid 1980s, via critiques of animal experimentation among other things. In the new series, the passionate hubris of the evil alchemist stereotype became the focus of antiscience critique while the inhuman researcher stereotype had a minimal presence, suggesting a pre-occupation with science over-reaching its material limits and seeking an unrealistic omnipotence, rather than concerns about its cruelty.

Haste identifies three myths that "permeate modern thought" and "reflect profound anxieties about our relationship with the natural world" (Haste, 1997, p. 114), essentially three kinds of antiscience cultural critique: Pandora's Box, the Sorcerer's Apprentice, and Prometheus/Faust. The first attributes blame for unleashed horrors to reckless scientific curiosity. The second concerns scientists who overconfidently dabble with forces they don't understand and cannot control. Both of these are manifest in Haynes' helpless scientist and evil alchemist stereotypes (Haynes, 1994, 2003). In the

Table 8. Modified versions of Table 7, showing (a) scientist villains who are represented in such a way as to shift responsibility for their actions *away from* science, and (b) scientist villains who embody critiques of science. Note that Davros appears in both tables, since his characterisation changes over time.

8(a)

Scientist stereotype	1960s (50 serials)	1970s (58 serials)	1980s (50 serials)	2000s (43 serials)
Evil alchemists *(6)*		Omega Sorenson Magnus Greel Stael Pirate Queen (5)	Omega Mawdryn & friends (1 unique)	
Mad scientists *(21)*	Meddling Monk Zaroff Kaftan & Klieg Salamander Vaughn (5)	The Master Winters & Jellicoe Kraals Solon Eldrad Taren Capel Scaroth (7)	Meglos Aukon The Master Monarch Davros Sharaz Jek Josiah Smith (6 unique)	Cassandra Carrionites The Master Capricorn Davros (3 unique)
Inhuman researchers *(12)*	Dalek scientists Locusta Macra (3)	Taltalian Chase Xoanon Drax (4)	Terileptil Solow Chessene Gilbert M (4)	Foster (1)
Scientist victims *(12)*	Waterfield (1)	Dawson Laurence Scarman Ransome Lamia (4)	George Cranleigh Maddox Kiston Romulus & Remus Azmael (5)	Magpie Docherty (2)
Foolish scientists *(7)*	Drahvins Garrett & Clent Dulcians (3)	Engineers (1)	Hardin Hayter (2)	Hobbes (1)
Total	12	21	18 unique	7 unique

8(b)

Scientist stereotype	1960s (50 serials)	1970s (58 serials)	1980s (50 serials)	2000s (43 serials)
Evil alchemists *(11)*	Lesterson Maxtible (2)	Lawrence Quinn Stahlman (3)	Pangol Dastari (2)	Krillitanes Lumic Hartman & Torchwood crew Lazarus (4)
Mad scientists *(2)*		Davros (1)		Cult of Skaro (1)
Inhuman researchers *(30)*	Moroks Senta Cybermen Janley Damon Dominators Gregory Krotons Alien Scientist (9)	Lennox Kettering IMC Azal Jaeger Linx Whitaker & Butler Styre Delta Magna crew Tryst (10)	Dexeter Quillam The Rani Borad Crozier Doland Captain Cook Light Judson (9)	Van Statten Sisters of Plenitude (2)
Helpless scientists *(21)*	Smithers Brett & Krimpton Arden Viner & Parry Professor Travers (5)	Winser & Hardiman Horner Ingram & Stu Stevens Kettlewell Marcus Scarman Stevenson Keeler Fendelman Kerensky (10)	Ambril Lasky Mathematician (3)	*Impossible Planet* crew *42* crew Rattigan (3)
Total	16	24	14	10

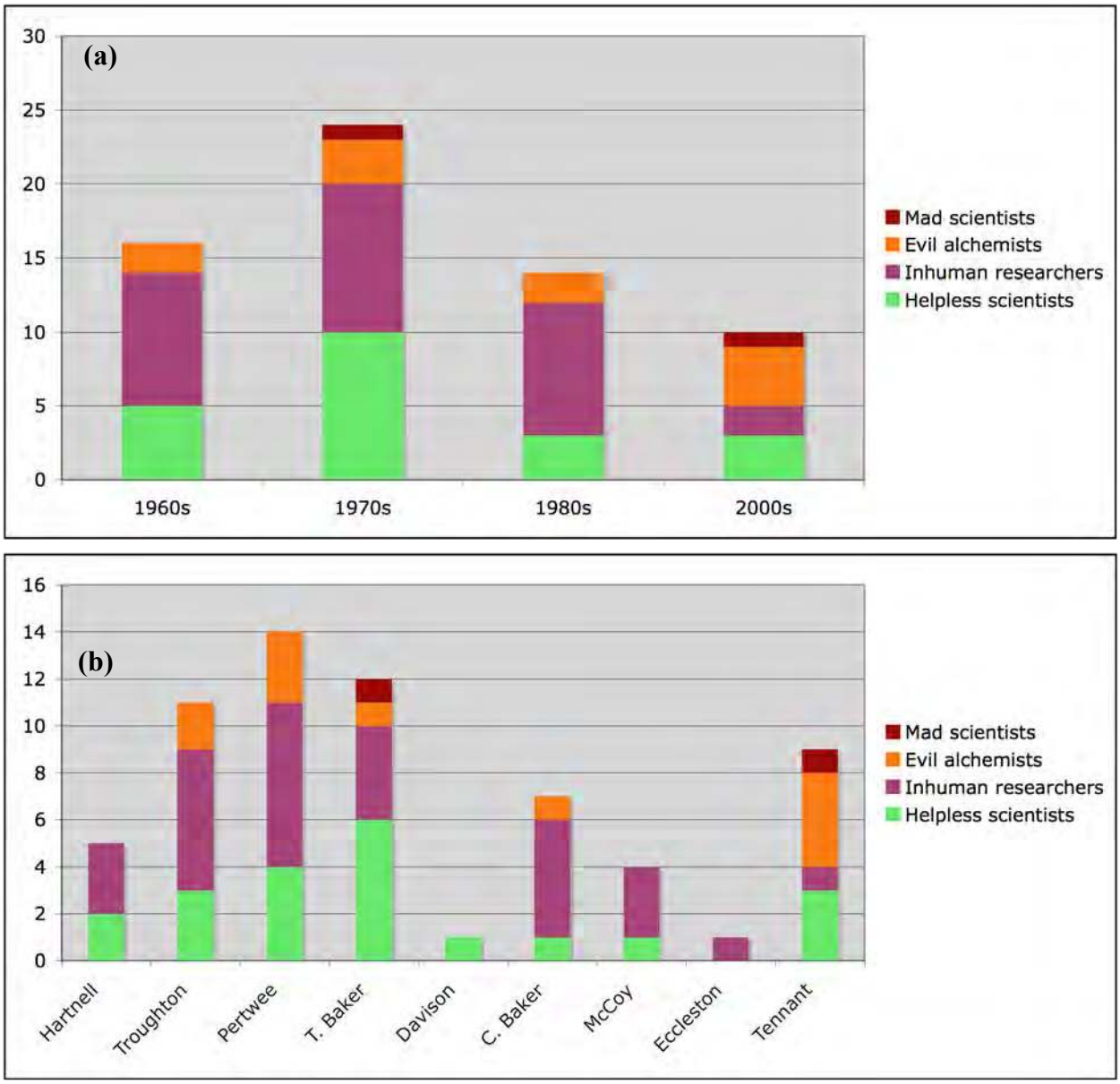

Figure 5. Trends in scientist villain stereotypes for the characters in Table 8b, (a) by decade and (b) by Doctor era. (a) Notable trends include the rise in helpless scientists during the 1970s, correlated with a reduction in the proportion (if not the absolute number) of inhuman researchers, and the virtual elimination of the inhuman researcher stereotype in the new series, with an absolute and relative comeback for the evil alchemist stereotype. (b) Were Tom Baker's 1980s serials removed from his statistics, his evil alchemist bar would disappear and the inhuman researcher bar would fall a notch, showing an even greater dominance of the helpless scientists during his core era.

third, which is the founding archetype of the evil alchemist category, scientists invite punishment by challenging God/Nature or by attempting to claim these powers for themselves. All three kinds of critique are present among *Doctor Who*'s helpless scientists, evil alchemists and mad scientists.

Pandora's Box science is very common in *Doctor Who*, especially in serials from the late '60s and the '70s and to a lesser extent the new series. It can come in the form of an apparent alternative source of virtually limitless energy or a cornucopian solution to world hunger, which literally opens a portal through which unholy monsters may travel. More often it manifests through the pursuit of knowledge for its own sake, including: idle tinkering or collecting; seemingly esoteric studies funded by someone else who knows better; the stubborn refusal to restrain intellectual curiosity despite others' warnings; the open pursuit of pure research that is inherently dangerous to the integrity of space-time or the search for a key to unlock alchemical secrets. In several cases, the science leads to the unleashing of a supernatural force that is the very essence of evil, including a manifestation of the Devil or some similar ancient destructive being, or the more mundane evils, the Cybermen and Daleks.[47]

Sorcerers' Apprentices in *Doctor Who* are less common, and are often naively altruistic, trying to benefit their society but failing to conform to safety standards, neglecting to complete rigorous scientific tests, and being too blinkered to foresee the consequences. Claimed benefits include forging peace by instituting a rational intelligence in a decision-making position, though said intelligence soon gets out of control. Scientists in this category who seek a solution to world hunger find that the solution causes more suffering than it saves.[48]

The scientists who best fit the Faustian arc are those who presumptuously believe that they can do better than that which Nature has offered them, by attempting to cheat natural death or save their people from extinction. Ultimately their science fails, their

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[47] Seek limitless energy: Stahlman, Stevens, Sorenson, Hartman & Torchwood crew. Seek solution to world hunger: Winser & Hardiman, Kerensky. Tinkering or collecting: Arden, Professor Travers, Quinn, Stevenson, Fendelman. Esoteric studies: Mathematician. Intellectual curiosity: Dastari, Viner & Parry, Horner, Marcus Scarman, Ambril. Dangerous to integrity of space-time: Ingram & Stu, *The Impossible Planet* crew. Alchemical secrets: Maxtible. Unleash manifestation of the Devil: Horner, Marcus Scarman, *The Impossible Planet* crew. Unleash ancient destructive being: Ingram & Stu, Fendelman, Ambril. Unleash Cybermen: Viner & Parry, Hartman. Unleash Daleks: Maxtible, Hartman.

[48] Institute rational intelligence: Brett & Krimpton, Lesterson. Solution to world hunger: Smithers, Lasky.

creations turn on them or they are defeated via an inherent weakness symbolic of their insurmountable mortality.[49]

Other elements also come into play in these critiques. Since their first serial, the Daleks have been a transparent metaphor for Nazi Germany (*The Daleks, The Dalek Invasion of Earth* (1964), *The Daleks' Master Plan* (1965-6), *The Power of the Daleks*, *Genesis of the Daleks*, *Remembrance of the Daleks* (1988)) because of their genocidal tendencies, homogeneity, hatred of non-Daleks, and propensity for order, efficiency and domination. In addition, their creation, repair or modification by scientists in laboratory situations (Lesterson, Davros, Ronson & Gharman, the Cult of Skaro) links lingering hatred of the Nazis to the Manhattan Project's responsibility for creating a weapon of mass destruction. *Genesis of the Daleks* in particular brings these things together. Its main characters have Nazi-style salutes and uniforms (including an Iron Cross), and its plot allegorically mirrors major events in the Nazis' rise to power, including the Reichstag fire, the Night of the Long Knives, and the eventual destruction of the leadership in an underground bunker. At the same time, it is set in a world ravaged by nuclear warfare in which the survivors bear radiation-induced mutations.

The horrific real world impacts of Nazi Germany and the Manhattan Project, particularly on the cultural contexts in which *Doctor Who*'s authors dwell(ed) (e.g. see Charles, 2007), have led to their being allegorically characterised as the ultimate, most despicable horrors imaginable, brought into the world through Pandora's Box recklessness ('what if . . .' scenarios), Sorcerer's Apprentice failures to introduce sufficient regulatory control, and Faustian ambitions for total command of humanity and nature. Inhuman researcher-style cold rationality is also inherent to the cultural constructions of these real world events. This has led to their being referenced in non-Dalek serials too, including *Inferno* (1970), which involves scientist Stahlman unleashing an unearthly force of total destruction through his obsessive pursuit of a new energy source. The serial includes a parallel universe version of the research project with Stahlman working under a totalitarian political regime and ultimately causing catastrophic destruction. Essentially the allegorical message is that had the Nazis developed the bomb, they would have destroyed the world. The solution to the

[49] Attempt to cheat death: Lumic, Lazarus. Save people from extinction: Cybermen, Davros, Pangol, Krillitanes, the Cult of Skaro. Science fails: Lazarus, Pangol. Creations turn on them: Davros, the Cult of Skaro. Inherent weakness: Lumic, Cybermen, Krillitanes.

threatening apocalypse in this serial is "free will", which saves our world from the same fate.

Scientist Hartman's opening of a Pandora's Box portal with help from her crew also leads to Nazi-like horrors and mass destruction pouring into our world, including both Daleks and Cybermen (*Army of Ghosts* (2006)). The Cybermen reference Nazism through their desire to make everyone the same, removing "sex and class and colour and creed", seeking to bring "everlasting peace and unity and uniformity". *Rise of the Cybermen* offers the most overt link between Cybermen and the Nazis: its aesthetic is art deco, it makes reference to New Germany, it features a sky full of zeppellins, and its final line, spoken by the anti-Cyber resistance, is "Let's go liberate Paris". As noted, Cybermen creator Lumic also closely resembles Davros (and both resemble fictitious ex-Nazi nuclear scientist Dr Strangelove) in being a wheelchair-dependent genius. The irony of Hartman's portrayal — perhaps indictating a less earnest approach to these themes in the new series — is that when she herself is converted into a Cyberman, her personality does not change. Her heartless patriotic commitment to 'duty', heretofore motivating her to find an energy source that will eliminate Britain's dependence on Middle East oil, remains unaffected by the loss of her emotions and she continues to fight the invading Cybermen on behalf of her country. To some extent this pathologises her motives, shifting the blame for catastrophe onto patriotic parochialism, not science.

The Cybermen stories, and to a lesser extent the Dalek stories, critique technocratic utilitarian ultrarationalism in which 'humanity' in the form of emotions and individuality is sacrificed for some 'greater good'. This also arises with Brett & Krimpton's invention of WOTAN (*The War Machines* (1966)), which reasons that humans should be eliminated to make way for machines. The Doctor frequently notes that he hates computers, especially in the series' earlier years (e.g. *The Ice Warriors*, *Robot*). The problem of the 'unnatural' having decision-making power is not limited to cybernetic science though, and the use of genetic techniques by Pangol (*The Leisure Hive*), Davros and the Cult of Skaro to reinvigorate their species and create an unstoppable army is criticised for the same reason: the loss of essential 'humanity'. Part of this critique is the removal of emotions, since the ability to feel and suffer, including the ability to accept death, is held as precious by the program's liberal humanist ideology. The Doctor tells Lazarus that "facing death is part of being human" (*The Lazarus Experiment)*; Sarah tells the Krillitanes that pain and loss "define us as much as

happiness or love" (*School Reunion* (2006)); and Polly is horrified at the Cybermen's statement that they "have freedom from disease", "do not feel pain", "have no need of emotions" and "are only interested in survival" (*The Tenth Planet* (1966)).

Emotionlessness is not the only problem here, however. The Cult of Skaro attempt to *reinstate* emotions into the Dalek biology (*Daleks in Manhattan*), but their desire to alter the 'natural' biology of a species is itself problematised. The contaminating influence of matter out of place is a key element of the horror in *Doctor Who* (Tulloch and Alvarado, 1983), so when science is its cause, science is indicted. In a sequence drawing on imagery from *Frankenstein* (Whale, 1931), the Cult of Skaro create human-Dalek genetic hybrids, a scheme which Martha considers insane and the Doctor is doubtful about. Dastari tampers with genetics to turn an Androgum (Chessene) — a creature of base desires obsessed with eating — into a genius, not foreseeing the inevitability that she will seek power over the universe. Similarly, Kerensky (*City of Death* (1979)), Pangol and Lazarus alter the ageing process via time technology and genetic techniques. Kerensky is naïve, Pangol is militarily ambitious and Lazarus is an egotist, so they all have different motivations, but what they have in common is overstepping normative boundaries of the natural. The same can be said for the Cybermen and Lumic who replace organicity with metal body parts and silicon chips. Lasky's plant breeding and genetic engineering experiments create a race of sentient crop plants, the Vervoids (*Terror of the Vervoids* (1986)), raising numerous ethical issues: the Vervoids resent the humans who wish to eat them, embark on a homicidal spree, and are eventually genocidally exterminated by the Doctor, who is held to account for this by the Time Lords. Sorcerer's Apprentice meddling thus itself creates ethical dilemmas that are almost impossible to resolve: its can of worms is not just the catastrophic loss of life but the new ethical frontiers it drags us into that we are not equipped to handle.

The program sometimes offers a way past these problems. Both Smithers and Stevens have failed to complete rigorous tests on their environmentally destructive technology, and are shown up by more competent noble scientists from Earth present. This mitigates the critique of polluting science by reassuring audiences that science is capable of safe and sustainable environmental management. Lazarus is similarly lectured on science ethics protocols by Martha. Noble scientists Ronson and Gharman (*Genesis of the Daleks*) and Bruchner (*Terror of the Vervoids*) refuse to participate in the evil science of

Davros and Lasky respectively, standing up for ethical ideals, although even the principled cannot always escape the consequences of their profession, with Ronson and Gharman both exterminated by the Daleks. The series also exhibits some sympathy for the unwitting products of biotechnology, with the condemnation of the Doctor's actions in exterminating the Vervoids, as well as the Doctor's eventual embrace of the Cult of Skaro's human-Dalek hybrids and the daughter he inadvertently produces by cloning (*The Doctor's Daughter* (2008)). In both the latter cases though, the Doctor's DNA has been incorporated into the creatures' biological makeup, influencing them to be 'good' not 'evil'. In effect, this justifies their acceptability to audiences without endorsing genetic engineering *per se*.

Most of the scientists discussed here are represented with fairly unequivocal condemnation, evidenced by the Doctor's warnings ringing loudly in viewers' ears. But we have already seen that Sorenson is forgiven all his sins, and the same is true of the scientists from *The Impossible Planet* (2006). They are exploring a planet orbiting a black hole and unwittingly unleash the Devil, yet their Pandora's Box curiosity receives the endorsement of the Doctor. He hugs crew member Zach, declaring his love for humans, upon realising they came to the planet just because it was there. He naturalises "the urge to fall" when exploring the pit down which the Devil is held captive, thus identifying himself with the scientists rather than standing in opposition to them.
This accounts for all the evil alchemists and most of the helpless scientists in the list of scientist villains embodying debates about science (Table 8b, p. 212). Accordingly, the objections so far raised to science have mostly been about unleashing powerful forces and the lack of foresight about consequences.

In a number of stories the foci of objections to science are less mystical horrors, and these mainly feature inhuman researchers. Several scientist characters are problematic because their science involves deliberate cruelty. The cruelty may serve the pursuit of knowledge, the harvesting of some biological resource, the creation of slaves, or the construction of a weapon or tool of social control.[50] These characters embody a number of different critiques of science. Azal (*The Dæmons* (1971)) and Light (*Ghost Light* (1989)) are arrogant 'higher' beings (resembling a demon and an angel respectively) who seek to destroy their research subjects (humans/life on Earth) when they fail to

[50] Pursuit of knowledge: Azal, Dexeter, Light, Van Statten. Biological resource: Senta, Krotons, the Rani, Crozier, Sisters of Plenitude, *42* crew. Slaves: Damon, Alien Scientist, Lennox, the Borad, Doland. Tool of social control: Gregory, Kettering, Styre, Quillam.

conform to scientific expectations. Several characters treat sentient beings as if they have no meaningful capacity for pain, paralleling real life animal rights debates.[51] The Krotons (*The Krotons* (1968-9)) and Crozier (*Mindwarp* (1986)) wish to consume entire sentient bodies, treating people as dispensible commodities. Gregory (*The Invasion* (1968)) and Quillam (*Vengeance on Varos* (1985)) are engineers employed to create cruel weapons, and they are indifferent to the suffering their work causes. The Borad and Kettering (*The Mind of Evil* (1971)) are also indifferent to suffering, even though they have very different motivations: the Borad wants to create a mate who will never leave him, while Kettering wants to rid violent prisoners of their 'intrinsic' evil. Damon (*The Underwater Menace*) and Lennox perform their cruel experiments on sentients under instruction from their superiors, representing the banality of science's day to day cruelty and the ease with which human beings can be convinced to participate in unethical behaviour.

A number of scientists commit genocidal atrocities and turn ecosystems into slag heaps in the service of empire building and wealth creation.[52] Most of their serials are allegories for colonialism. This reinforces the critique of science and technology because of the high level of consensus in *Doctor Who* about rejecting colonialist regimes. Like the Krotons and Crozier, these characters treat people and/or planets as dispensible commodities.

Finally, some scientist characters are problematic simply because the ends they serve are deemed inappropriate for scientists. Keeler (*The Seeds of Doom*) participates in murderous acts that benefit the scientific pursuits of his boss, Chase, simply because it is his job, although there is a hint of coercion in his statement that Chase owns him, "body and soul". Linx (*The Time Warrior*) and Captain Cook (*The Greatest Show in the Galaxy* (1988)) are solely interested in self preservation, and because of this are indifferent to the suffering their expert scientific tinkering causes. They participate in science with a cruel disinterest, equivalent to stirring up an ants' nest to see what happens. For the remaining scientists, political ends are their motivation. Janley (*The Power of the Daleks*) and Rattigan (*The Sontaran Strategem*) both attempt to use technologically created aliens (Daleks and cloned Sontarans) as weapons to forcibly install new political regimes. Much like Winters and Jellicoe, though taken more

[51] Dexeter, Van Statten, Senta, the Rani, the Sisters of Plenitude, the *42* crew, the Alien Scientist, Styre, Doland.
[52] Moroks, Dominators, Interplanetary Mining Corporation, Jaeger, Delta Magna crew, Tryst, Judson.

seriously than them by the program, Rattigan wishes to see society ruled more rationally, specifically by himself. Janley is more sympathetic than him, since she seeks to install democratic rule through a revolution, but nonetheless she lets a fellow scientist die at the hands of the Daleks in order to achieve this end. Whitaker and Butler (*Invasion of the Dinosaurs* (1974)) and Kettlewell (*Robot*) represent 'envirofascism': they each wish to force the world to be more environmentally sustainable, disregarding liberal demands for choice and free will. In Whitaker and Butlers' case, this involves destroying all human life on Earth bar a few elite conservationists.

Interpreting the significance of these characters

The authors of these *Doctor Who* stories essentially function as channels for the conscience of sectors of 'the public'. To some extent, these serials are responses to particular scientific developments: the creation of weaponry, animal experimentation, or mining on indigenous land. At various times and places in real life, the 'powers that be' have sanctioned scientific research for weaponry, live animal testing of medicines, and the pillaging of natural resources regardless of the human cost, and this adds meaning and weight to the fictionalised stories. This reading includes those technologies that have not yet been fully developed or sanctioned (e.g. human cloning, cyberisation, etc), but which are seen as future possibilities. In all cases, the fiction is then a form of protest, even if directed at the future.

This reading somewhat misses the point, however. *Generalised* themes of critique may be gleaned from this analysis of more than fifty serials, or over a quarter of the *Doctor Who* canon. Scientists are deemed problematic when they:

- create weapons of mass destruction
- collaborate with evil regimes or problematic political ideologies
- advocate utilitarian ultrarationalism
- alter nature
- are careless and lack rigour
- are reckless
- indulge intellectual greed
- treat people as experiments or commodities

- cause pain or torture
- play a role in exploitation of the Earth
- serve colonialist powers
- are primarily self serving
- force their beliefs on others
- participate in the above because they are just ‘obeying orders’.

The solutions counterposed to these problems include (more or less respectively):

- peace
- democracy
- compassion
- respect for boundaries
- agreed upon safety standards
- caution
- altruism
- individualism
- humane respect
- conservation and sustainability
- freedom and self-determination
- civic duty
- liberalism
- responsibility.

The noble scientists that feature in *Doctor Who* (Table 7, p. 196) all embody one or more of these qualities, reinforcing this counterposition and reconciling its contradictions into a consistent ideological statement. Although they are generally peace-loving, when civic duty calls they will take up arms in altruistic service (the UNIT technicians, Magambo, various crews). They are consistently democratic, liberal and individualist in their beliefs and their manner. They are compassionate, humane, cautious, and take responsibility for their actions, even to the point of self sacrifice for the sake of others (Styles, River Song). Some of them champion sustainability (Farrow, Cliff Jones) and self-determination (Sondergaard). In general, they are nice, gentle people, who use their science for altruistic ends and are not afraid to do their bit for humanity.

These lists of core moral traits suggest that taking the critique of particular technologies too literally is a narrow-minded approach to interpreting the serials that feature scientist villains. These stories do much more than that: a significant part of their function is to reinforce core societal values in the face of forces that appear to threaten them. In other words, they identify the specific elements and trends within science that stand in opposition to core values, and show why they constitute more than a simple management problem. These are not serials about the technical hazards of science and technology. They are, as Wynne (2008) argues, framed as public issues of concern to all of us. These serials are an expression of deep discontent with tendencies of science, representing a clash of incompatible ideologies, as Toumey (1992, 1996) has argued. The scientist villains all lack an essential quality of human discernment: the wisdom to recognise right from wrong.

In understanding *Doctor Who*'s contribution to the democratisation of science, this framing of the issues for public discussion is crucial to note. In this chapter I have shown that understanding this contribution is not as straightforward as is assumed within the literature because scientist characters are not always representative of science *qua* science, but can be used to serve contradictory moral messages. In this way, *Doctor Who* undermines a tool of public protest against science.

In most eras of *Doctor Who* the proportion of serials featuring scientist villains closely matches the proportion that feature noble scientists (Figure 6), suggesting that the program has been consistently relatively 'balanced' in its representation of the morality of scientists, countering objections with positive science role models. The early to mid 1980s Doctor eras provide something of an exception, with the Davison era overrepresented by noble scientists and the Colin Baker era underrepresented (Figure 6b). This proportional difference is mainly explained by the number of scientist villains, with these eras representing the extreme ends of the spectrum (5% and 55% of serials respectively feature scientist villains), supporting the contention that the Colin Baker era was largely critical of science.

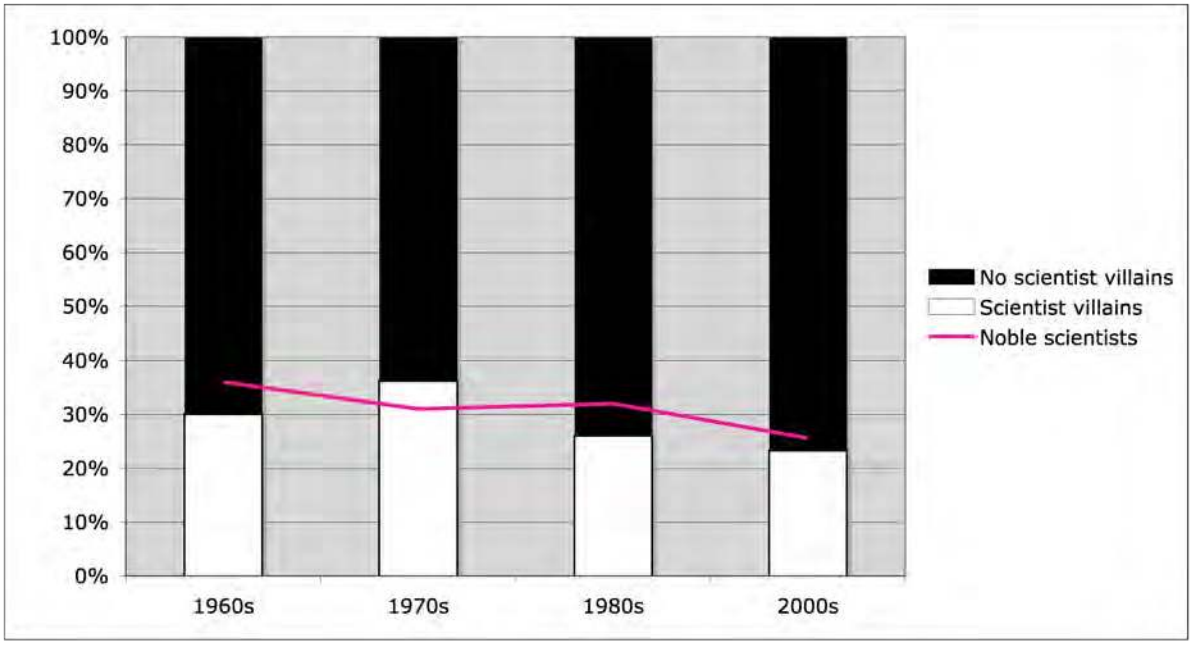
The Davison era, however, was neither scientistic nor particularly pro-science (Chapter 4), but rather focused on other issues. Hence, some of its noble scientist characters were unconventional in their approach to science, with Mergrave (*Castrovalva* (1982)) being a traditional herbalist and pharmacist, and Dojjen (*Snakedance* (1983)) renouncing

science for spirituality. Todd (*Kinda* (1982)), the Garm (*Terminus* (1983)), and Laird and Styles (both *Resurrection of the Daleks* (1984)) all served important narrative functions in tales about oppression rather than about science, and were as much freedom fighters as scientists. Kyle (*Earthshock* (1982)), too, effectively functioned as a soldier, because her main task was to help soldiers find her lost colleagues in a cave. These characters then mirror the situation of the 'mad' scientists in embodying non-science concerns.

This raises the question: why make these characters scientists at all? One answer is that the program actively engaged with societal demands for gender equality in the 1980s. Over half of these characters — Todd, Laird, Styles, Kyle — are women. In this, the Davison era had a far greater percentage (63%) of its goodie scientists being played by women than any other era in the original series, and matched only in the Tennant era (64%).[53] But is this mere tokenism if the characters were not seen to perform credible science? This and other issues for democratisation at an individual level are discussed in the next chapter.

[53] Runners up were the eras of Eccleston (50%), Troughton (38%) and McCoy (33%), followed by Tom Baker (29%) and Pertwee (25%), with neither Hartnell's Doctor nor Colin Baker's meeting any female noble scientists. Statistics include pair or group characters that contain at least one female member.

(a)



(b)

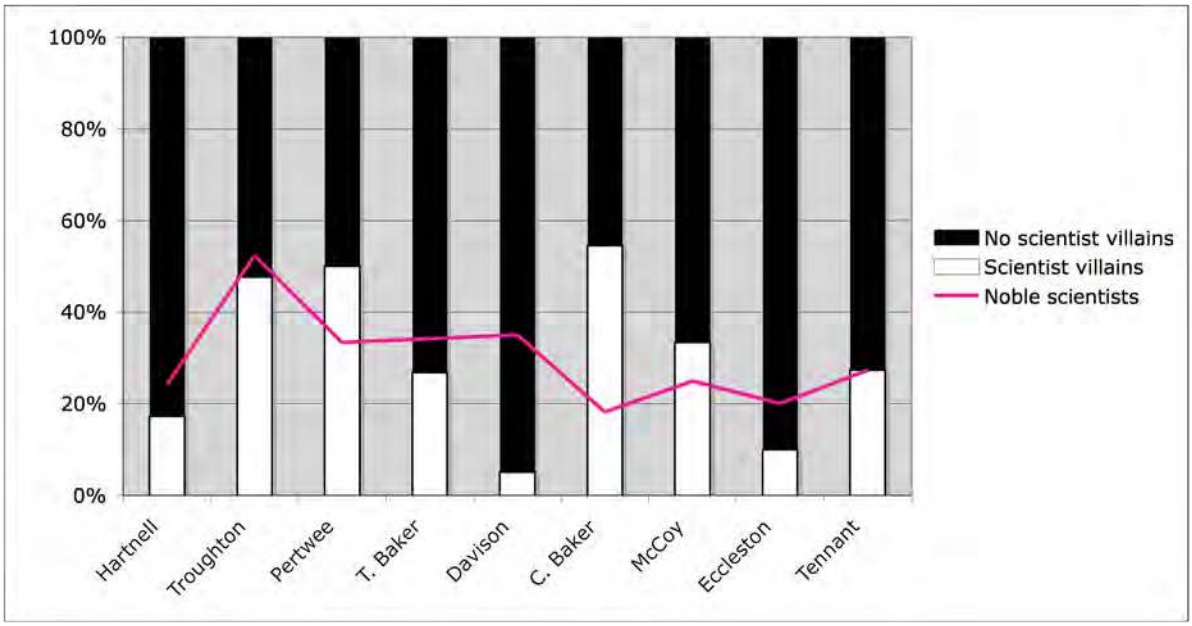


Figure 6. Percentage of serials featuring one or more of the scientist villains in Table 8b (white bars) and one or more noble scientists from Table 7 (pink line), (a) by decade and (b) by Doctor era. The coloured bars in Figure 5 correspond more or less to the white bars in this figure, bearing in mind some serials have more than one scientist villain so the match is not exact. (a) There is a remarkably similar percentage of serials that feature scientist villains and that feature noble scientists, regardless of the decade, suggesting a more or less 'balanced' representation of science's moral status throughout the series. (b) However, the percentages vary much more dramatically between Doctor eras. The percentage of serials featuring scientist villains varies from 5% in the Davison era to 55% in the Colin Baker era that followed it. These two eras also exhibit the most striking discrepancy between percentage of serials with a scientist villain and those with a noble scientist. The numbers perhaps suggest that the Davison era was the era least concerned with critiquing science *per se*, while the Colin Baker era was the most critical of science on average. The Troughton and Pertwee eras were both highly engaged with debates about science.

CHAPTER 7 REFLEXIVITY AND ROLE MODELS THE 'FALLIBLE SCIENTIST'

The third and final analytical chapter of the thesis shifts the focus away from an analysis of serials and their points of ideological closure, away from tales about the structures of social and scientific governance or allegories for grappling with science ethics. In this chapter I look at characters who have the potential to role model for viewers an empowered relationship to science, be it a career relationship (i.e. as a scientist) or a relationship as a member of the 'lay public'. In *Doctor Who* the most important such characters are companions, since their defined dramaturgic function is to be a point of audience identification. The representation of many of the companions has implications for equality and/or franchise, whether the companions are scientists, non-scientists, or something in between. I discuss these issues with respect to the relationships some of these companions have with the Doctor and with each other.

Wynne (1993) has called for scientists to adopt a reflexive attitude towards the social role of science in order to allow greater public access to science. Collins and Pinch (1998) similarly contend that shifting the public image of science to one that is fallible rather than deified or demonised is critical for rendering science accessible to the public. Locke (1999) critiques Collins and Pinch's rigid notion of how 'the public' perceive science, stating that people's image of science will vary through time, space and context, but ultimately agrees that science should ideally be represented "warts and all, irresolution and untidiness exposed" (Locke, 1999, p. 88). How important, then, is it for equality and franchise that the Doctor express fallibility? Is it equally important that scientist companions express fallibility? And is this likely to undermine their credibility as scientists and their equality in the science workplace? These are key questions for the chapter.

Before embarking on the extensive discussion of companions, I present a semi-quantitative review of the patterns of relationship between gender and scientific credibility in the program as represented by non-regular scientist characters. In Chapter 6 I showed that gender non-conformity and implied queerness is associated with ineffectual science, but in this chapter I deal with those scientist characters whose scientific skills are basically effectual, i.e., those who are not foolish scientists. Steinke

(2005) recommends that research compare representations of female and male scientist characters rather than solely targeting female scientist characters as existing studies have done, so that is the approach I take. This review is the part of the chapter that speaks most directly to the literature in this area. Some of the literature has also looked at inclusivity in representation of other marginalised peoples as scientist characters (e.g. Flores, 2002). I therefore comment on other axes of social power occasionally, but given the relative dearth of demographic diversity in *Doctor Who* until the new series, especially with respect to scientist characters, I focus on inclusivity towards women.[54]

Gender and equality in science

Issues for representations of female scientist characters

The sexist claim that women are incapable of participating credibly in science has a long history, accompanied by a long history of resistance. The claim is founded on assumptions which centre around biology, either with intellectual activity touted to have an adverse impact on women's health, or with assumptions made that women have hard-wired limits to their intellectual abilities. This scholarly invocation of biologically determinist myths of inadequate biology to explain the relative scarcity of women in the sciences stretches back to the Enlightenment and beyond (Birke, 1986; Le Doeuff, 2003; Schiebinger, 1989; Walton, 1986). Incredibly, that particular myth — of men's innate biological superiority over women regarding scientific skills — still seems to require refutation today, with a 2009 national inventory on women's participation in science in Australia spending words doing so (Bell, 2009). It is commonly claimed in Western culture that women are better suited to 'feminine' matters — aesthetic, emotional and relational — than to 'masculine' matters rational and technical. Such views are major obstacles to women's equal participation in the sciences.

The goal of equality in science requires that women and other marginalised peoples have equal access to careers and other kinds of active participation in scientific practice alongside dominant peoples. Recent UK studies drawing on interviews with scientists have emphasised the importance of female scientist characters in fiction for role-modelling women in the science workplace (Haran et al., 2008; Kitzinger et al., 2008).

[54] I have discussed the politics of race in *Doctor Who* in general elsewhere (Appendix D, Orthia, in press-b).

We have seen that astronaut Mae Jemison drew career-path inspiration from African American actor Nichelle Nichols' portrayal of a technically competent, space-travelling character on *Star Trek* (Penley, 1997). Others have advocated for a female Doctor for essentially the same reason (Cook, 2006; *The Telegraph*, 2008).

Scholars disagree about the presence in fiction of cultural assumptions about women's inability to do science. According to most studies, female scientist characters are generally represented as competent in their work, dispelling the sexist myth of women's incapacity (Haran et al., 2008; Jones, 2005; Steinke, 2005). Flicker's (2003) typology of the female scientist stereotypes in films shows that this is not entirely true, with competence varying. Flicker's 'male woman' and 'daughter/assistant' types are both inferior to their male colleagues in competence, while her 'naïve expert' type is highly qualified but with no field competence, so gets into trouble easily and needs to be rescued. Competence in the 'old maid' stereotype is critical to the character's narrative arc: she begins highly competent but alone, then falls in love and begins to make mistakes, and finally her femininity is reinstated through romance and the abandonment of her science. Flicker's 'lonely heroine' type is defined by her high level of competence but lack of collegial recognition.

Flicker, Haran and colleagues, Steinke and Flores (2002) all note that female scientist characters often face challenges to their status and questions about their qualifications. They are frequently subordinate or junior staff members, and if on a team are usually tokenistic in being the only woman (Haran et al., 2008; Steinke, 2005). Jones notes that all the scientists he studied were called 'Miss' not 'Dr', the Miss signifying a gendered attitude and possible denial of their qualifications, and also sending the message that family and careers are not compatible. This title of his paper, 'How many female scientists do you know?', signifies a general dearth of female scientist characters compared to men; Flicker, Flores and Weingart *et al.* (2003) also state that women and people from ethnic minority groups are highly underrepresented among scientist characters in films compared to population means.

Flicker, Haran *et al.*, Jones and Steinke all agree that most female scientist characters are very grounded and 'realistically' presented, and do not tend to possess stereotypical scientist traits of madness, clumsiness, eccentricity, outsider status and so on. Haran and colleagues' study of contemporary television programs suggests that female scientist

characters are usually both exceptional at their work and ordinary in the rest of their lives. All these scholars, however, identify the unrealistic youth and beauty of female scientist characters, in respect of which they are neither realistic nor ordinary.

Female scientists are frequently depicted in romantic and sexual relationships, and this rather than science is often the focus of their personal narrative arc and their function in the overarching plot (Flicker, 2003; Haran et al., 2008; Jones, 2005; Steinke, 2005). Emotionality and social competence are common traits: female scientist characters can be relational bridges between (male) rational scientists and everyone else (Flicker, 2003). Mwenya Chimba and Jenny Kitzinger (2009, and references therein) show similar trends in the media's representation of real-life female scientists, including Nobel Prize winners: stereotypically feminine traits such as dressing fashionably and rearing children as well as traits signifying sexuality and attractiveness are frequently foregrounded in descriptions of these scientists. Scientists who Chimba and Kitzinger interviewed generally objected to this and to the qualifier *female* being added to descriptions of them in the media — i.e. "female scientists".

In all of this, female scientist characters frequently inhabit a primary narrative function *other than* 'scientist': love interest, emotional bridge, victim to be rescued, and so on. In addition, they often face challenges to their credibility including their qualifications, technical ability, autonomy and expertise. Such challenges may be issued by other characters. They may also be issued more subtly by authors through plot resolutions that signal women's inferiority to male scientists, their dependence on men, or their orientation towards romance and relationships not science.[55]

Non-regular female and male scientist characters in Doctor Who

Bearing these considerations in mind, the following list of six criteria together constitute markers of scientific credibility that have often been denied to female characters. In this section I compare non-regular female and male scientist characters in *Doctor Who* specifically with reference to these criteria.

[55] Haran *et al.*, Jones and Steinke also discuss problems with representations of the work-life balance of female scientists, but since few of the scientist characters in *Doctor Who* have children, I do not address that here.

- *Sheer numbers.* How many female and male scientist characters are there?
- *Primary narrative function*. Is the character there primarily to perform science or do they have a different function, such as love interest or consort to a powerful other, freedom fighter, or villain/victim with a non-scientific agenda?
- *Title*. Does the character have a specialist title that grants them status and credibility in the sciences (usually 'Professor' or 'Dr') or are they addressed by a gendered or non-specialist title (usually 'Miss' or 'Mr')?
- *Performing science*. Is the character shown actively engaged in scientific activity on screen? This does not include talking about science or managing scientific operations, although those things have bearing on other criteria.
- *Autonomous authority.* Does the character have autonomy and/or authority in their working environment? This includes consideration of juniors, assistants and scientists working in bondage to others versus independent, management level or senior scientists.
- *Recognised expertise.* Does the character exhibit specialist scientific knowledge or an expert skill that is recognised by others? This can include expertise that is found wanting by the Doctor (such as Magnus Greel's faulty science as discussed in Chapter 6). Alternatively, are they generalist in their work with science? Reported achievements can contribute to this criterion.
- *Look like a scientist.* Does the character don the trappings of science, giving them the appearance of a scientist? In *Doctor Who*, the most common way of indicating that non-regular characters are scientists is to put them in a white coat and/or give them a clipboard and pen.[56] Such trappings can grant scientific credibility to a person in the absence of information to the contrary, including sometimes for real life people (Lamberts, 2005).

To facilitate the cross-gender comparison, I classified each non-regular scientist character in Table 7 (p. 196) according to these criteria (Table 9), excluding foolish scientists and the three non-humanoid non-gendered characters the Macra, the Krotons and Xoanon. I treated mixed-gender paired or group characters separately from individual and single-gender paired or group characters (Table 10). I listed the gender-

[56] Serials for which I noted the presence of white coats and/or clipboards as markers of 'scientist' during my research were (anecdotally not exhaustively) *Planet of Giants, The War Machines, The Power of the Daleks, The Invasion, The Seeds of Death, The War Games, Spearhead from Space, The Silurians*, *The Ambassadors of Death, Inferno, Terror of the Autons, The Mind of Evil*, *The Claws of Axos, The Dæmons, The Mutants, The Time Monster, The Time Warrior, Robot, The Android Invasion, The Seeds of Doom, The Hand of Fear, The Androids of Tara, City of Death, Full Circle, Aliens of London, The Empty Child, Rise of the Cybermen, Army of Ghosts, Smith and Jones, Last of the Time Lords, The Sontaran Strategem*.

Table 9. Traits of scientist characters who are (a) female and (b) male. Traits that detract from a scientifically credible image for the character or emphasise gender over profession are highlighted in red. Mixed gender pair and group characters and foolish scientists are not included. (c) Compares female and male totals (three pages hence).

9(a) Female scientist characters

Narrative function	*Character*	*Title*	*Perform science on screen*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist*
'Scientist'						
Noble scientist (11)	Anne Travers	Miss	Yes	Yes	Yes	Yes
	Megan Jones	Miss	No	Yes	Yes	No
	Corwyn	Mrs	Yes	Yes	Yes	Yes
	Kelly	Miss	Yes	Yes	Yes	Yes
	Rodan	-	Yes	No	No	No
	Rumford	Prof	Yes	Yes	Yes	Yes
	Todd	-	No	Yes	Yes	Yes
	Jensen & Williams	Prof/Miss	No	Yes	Yes	No
	Sato	Dr	Yes	Yes	Yes	Yes
	Dee Dee	-	Yes	No	Yes	No
	Magambo	Captain	Yes	Yes	Yes	No
Scientist villain (4)	Janley	-	Yes	Yes	No	Yes
	The Rani	-	Yes	Yes	Yes	No
	Lasky	Prof	Yes	Yes	Yes	No
	Sisters of Plenitude	Sister	Yes	Yes	Yes	Yes
'Other'						
Villain or victim with non-scientific ambition or motive (10) (based on Table 7a)	Locusta	-	Yes	No	Yes	No
	Pirate Queen	-	No	Yes	Yes	No
	Eldrad	-	Yes	Yes	Yes	No
	Ransome	Miss	No	No	Yes	Yes
	Solow	-	Yes	Yes	Yes	Yes
	Chessene	-	No	Yes	Yes	No
	Cassandra	-	No	Yes	No	No
	Carrionites	-	Yes	Yes	Yes	No
	Docherty	Prof	Yes	Yes	Yes	Yes
	Foster	Miss	Yes	No	Yes	No

cont'd...

Table 9(a) cont'd

Narrative function	*Character*	*Title*	*Perform science on screen*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist*
'Other'						
Love interest or consort to powerful man (8)	Dawson	Miss	Yes	No	No	Yes
	Petra Williams	Miss	Yes	No	No	Yes
	Vira	-	Yes	Yes	Yes	Yes
	Lamia	-	Yes	No	Yes	Yes
	Hame	Novice	No	No	No	Yes
	Redfern	Nurse	No	Yes	Yes	Yes
	Chan-Tho	-	No	No	No	Yes
	River Song	Prof	Yes	Yes	Yes	Yes
Noble scientist acting as freedom fighter (3)	Kyle	Prof	No	Yes	Yes	No
	Laird	Prof	No	Yes	Yes	No
	Styles	-	No	Yes	Yes	Yes

9(b) Male scientist characters

Narrative function	*Character*	*Title*	*Perform science on screen?*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist?*
'Scientist'						
Noble scientist (38)	Artamon	-	No	Yes	Yes	No
	Sensorite scientists	-	Yes	Yes	Yes	Yes
	Farrow	Mr	No	Yes	Yes	No
	Dortmun	-	Yes	Yes	Yes	No
	Rills	-	Yes	Yes	Yes	No
	Preslin	Monsieur	No	Yes	Yes	No
	Barclay & base crew	Dr/Military	Yes	Yes	Yes	Yes
	Valmar	-	Yes	No	Yes	No
	Moonbase crew	Mr	Yes	Yes	Yes	Yes
	Penley	-	Yes	Yes	Yes	No
	Harris	Mr	Yes	Yes	Yes	Yes
	Watkins	Prof	Yes	Yes	Yes	Yes
	UNIT	Military	Yes	Yes	Yes	No
	Beta	-	Yes	Yes	No	No
	Eldred	Prof	Yes	Yes	Yes	Yes
	Cornish	Prof	Yes	Yes	Yes	Yes
	Summers	Dr	Yes	Yes	Yes	Yes
	Holden	-	Yes	Yes	Yes	No
	Sondergaard	Prof	Yes	Yes	Yes	No
	Cliff Jones	Prof	Yes	Yes	Yes	Yes
	Rubeish	Prof	Yes	Yes	Yes	Yes
	Ronson & Gharman	-	Yes	Yes	Yes	Yes
	Giuliano	-	No	Yes	Yes	No
	Watson	Prof	Yes	Yes	Yes	Yes
	Litefoot	Prof	Yes	Yes	Yes	Yes
	Marius	Prof	Yes	Yes	Yes	Yes
	Colby	-	No	Yes	Yes	Yes
	Binro	-	No	No	Yes	No
	Kalmar	-	Yes	Yes	No	No
	Tremas	-	Yes	Yes	Yes	No
	Monitor	-	Yes	Yes	Yes	No
	Mergrave	-	Yes	Yes	Yes	No
	Garm	-	Yes	No	Yes	No

cont'd...

9(b) cont'd

Narrative function	*Character*	*Title*	*Perform science on screen?*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist?*
'Scientist'						
Noble scientist (cont'd)	George Stephenson	-	Yes	Yes	Yes	No
	Bruchner	-	No	No	Yes	No
	Warmsley	Mr	Yes	Yes	Yes	Yes
	Constantine	Dr	Yes	Yes	Yes	Yes
	Yana	Prof	Yes	Yes	Yes	Yes
Scientist villain (54)	Smithers	Mr	Yes	No	Yes	Yes
	Moroks	-	Yes	Yes	Yes	No
	Senta	-	Yes	Yes	Yes	No
	Brett & Krimpton	Prof/Prof	Yes	Yes	Yes	Yes
	Cybermen	-	Yes	Yes	Yes	No
	Lesterson	-	Yes	Yes	Yes	Yes
	Damon	-	Yes	No	Yes	No
	Maxtible	Mr	Yes	Yes	Yes	Yes
	Viner & Parry	Mr/Prof	Yes	Yes	Yes	No
	Arden	-	Yes	Yes	Yes	No
	Professor Travers	Prof	Yes	Yes	Yes	Yes
	Dominators	-	Yes	Yes	Yes	No
	Gregory	-	Yes	Yes	Yes	Yes
	Alien Scientist	-	Yes	Yes	Yes	Yes
	Quinn	Dr	Yes	Yes	Yes	Yes
	Lawrence	Dr	Yes	Yes	Yes	Yes
	Lennox	Dr	Yes	No	Yes	Yes
	Stahlman	Prof	Yes	Yes	Yes	Yes
	Kettering	Prof	Yes	Yes	Yes	Yes
	Winser & Hardiman	Prof/-	Yes	Yes	Yes	Yes
	IMC	-	Yes	Yes	Yes	No
	Horner	Prof	Yes	Yes	Yes	Yes
	Azal	-	No	Yes	Yes	No
	Jaeger	Prof	Yes	Yes	Yes	Yes
	Stevens	Mr	Yes	Yes	Yes	No
	Linx	-	Yes	Yes	Yes	No
	Whitaker & Butler	Prof/-	Yes	Yes	Yes	Yes
	Kettlewell	Prof	Yes	Yes	Yes	Yes

cont'd...

9(b) cont'd

Narrative function	*Character*	*Title*	*Perform science on screen?*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist?*
'Scientist'						
Scientist villain (cont'd)	Styre	-	Yes	Yes	Yes	No
	Davros	-	Yes	Yes	Yes	No
	Marcus Scarman	Prof	Yes	Yes	Yes	Yes
	Stevenson	Mr	Yes	Yes	Yes	Yes
	Keeler	Mr	Yes	No	Yes	Yes
	Fendelman	Dr	Yes	Yes	Yes	Yes
	Delta Magna crew	-	Yes	Yes	Yes	No
	Kerensky	Prof	Yes	No	Yes	Yes
	Tryst	-	Yes	Yes	Yes	No
	Pangol	-	Yes	Yes	Yes	No
	Dexeter	-	Yes	Yes	Yes	No
	Ambril	-	Yes	Yes	Yes	No
	Quillam	Mr	Yes	Yes	Yes	No
	Dastari	Prof	Yes	Yes	Yes	Yes
	Borad	-	Yes	Yes	Yes	No
	Crozier	Dr	Yes	Yes	Yes	Yes
	Doland	-	No	Yes	Yes	No
	Mathematician	-	Yes	No	Yes	No
	Captain Cook	Captain	No	Yes	Yes	No
	Light	-	Yes	Yes	Yes	No
	Judson	Dr	Yes	Yes	Yes	Yes
	Van Statten	Mr	Yes	Yes	Yes	No
	Lumic	Mr	Yes	Yes	Yes	Yes
	Cult of Skaro	-	Yes	Yes	Yes	No
	Lazarus	Prof	Yes	Yes	Yes	Yes
	Rattigan	Mr	Yes	Yes	Yes	Yes

cont'd...

9(b) cont'd

Narrative function	*Character*	*Title*	*Perform science on screen?*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist?*
'Other'						
Villain or victim with non-scientific ambition or motive (32) (based on Table 7a)	Dalek scientists	-	Yes	Yes	Yes	No
	Meddling Monk	-	No	Yes	Yes	No
	Zaroff	Prof	Yes	Yes	Yes	Yes
	Waterfield	Mr	Yes	No	Yes	No
	Salamander	-	No	Yes	Yes	No
	Vaughn	Mr	Yes	Yes	Yes	No
	Taltalian	Dr	Yes	Yes	Yes	Yes
	The Master	-	Yes	Yes	Yes	No
	Omega	-	Yes	Yes	Yes	No
	Kraals	-	Yes	Yes	Yes	No
	Sorenson	Prof	Yes	Yes	Yes	No
	Solon	Dr	Yes	Yes	Yes	No
	Chase	Mr	Yes	Yes	Yes	No
	Taren Capel	-	Yes	Yes	Yes	No
	Magnus Greel	-	Yes	Yes	Yes	No
	Stael	-	Yes	Yes	Yes	Yes
	Scaroth	-	No	Yes	Yes	No
	Drax	-	Yes	No	Yes	No
	Meglos	-	Yes	Yes	Yes	No
	Aukon	-	No	Yes	No	No
	Monarch	-	No	Yes	Yes	No
	Terileptil	-	Yes	Yes	Yes	No
	George Cranleigh	-	No	Yes	Yes	No
	Mawdryn & friends	-	Yes	Yes	Yes	No
	Maddox	-	Yes	No	Yes	No
	Kiston	-	Yes	No	Yes	No
	Sharaz Jek	-	Yes	Yes	Yes	No
	Romulus & Remus	-	Yes	No	Yes	No
	Gilbert M	-	No	No	Yes	No
	Josiah Smith	Mr	No	Yes	No	No
	Magpie	Mr	Yes	No	Yes	No
	Max Capricorn	Mr	No	Yes	No	No
Consort to powerful man (2)	Laurence Scarman	Mr	Yes	No	No	No
	Jackson	Mr	Yes	Yes	No	No
Noble scientist acting as freedom fighter (5)	Chela & Dojjen	-	No	Yes	Yes	No
	Azmael	Prof	No	No	Yes	No
	Earl Sigma	-	Yes	No	Yes	No
	Milligan	Dr	No	Yes	Yes	Yes
	Ryder	Dr	Yes	Yes	Yes	Yes

9(c) Statistical comparison between female and male scientist characters. p-values are for double-sided t-tests testing the difference between two proportions. 'Total' p-values test $N_{totalF}/N_{totalF+M}$ against $N_{totalM}/N_{totalF+M}$. Other traits test N_{traitF}/N_{totalF} against N_{traitM}/N_{totalM}. In 'Title' tests excluding the 'Neither' category, $N_{total} = N_{black+red}$.

All characters. The dominance of male scientist characters is statistically significant ($p < 0.000$). Men are significantly more likely than women to fulfil a primary narrative function of 'scientist', to perform science on screen, and to have recognised expertise ($p < 0.05$). Women are substantially more likely than men to look like scientists at a moderate level of significance ($p < 0.1$). Men are substantially more likely to hold positions of autonomy and/or authority, and slightly more likely to have a specialist title, while women are substantially more likely to have a non-specialist/gendered title, but all of these only at a significance level of $p > 0.1$.

Characters whose primary narrative function is 'scientist'. Aside from the difference in the total number of scientists ($p < 0.000$), significant differences between genders disappear in this subset ($p > 0.1$), probably because of the lower sample size of female scientist characters.

Characters whose primary narrative function is 'other'. The same is true in this subset, except for the striking difference that 'other' women are significantly more likely than 'other' men to look like scientists ($p < 0.001$). This subset explains the marginally significant gender difference observed for this trait in the whole set.

	Total	*Primary narrative function*	*Title*	*Perform science on screen?*	*Autonomy or authority in work*	*Recognised expertise*	*Look like a scientist?*
(a) Female characters	36	Scientist 15 Other 21	Black 9.5 Red 10.5 Neither 16	Black 23 Red 13	Black 26 Red 10	Black 29 Red 7	Black 20 Red 16
(b) Male characters	131	Scientist 92 Other 39	Black 41.5 Red 22.5 Neither 67	Black 109 Red 22	Black 111 Red 20	Black 124 Red 7	Black 51 Red 80
p-values, all characters ** < 0.05 * < 0.10	0.0000**	0.0031**	**Incl 'Neither'** 0.5319 **0.1531** **Excl 'Neither'** 0.1855	0.0290**	0.1294	0.0453**	0.0796*
p-values, functionally 'scientist' characters only	0.0000**	-	**Incl 'Neither'** 0.5611 **0.1354** **Excl 'Neither'** 0.1662	0.4090	0.7955	0.2273	0.8124
p-values, functionally 'other' characters only	0.0008**	-	**Incl 'Neither'** 0.5997 **0.7702** **Excl 'Neither'** 0.8699	0.2105	0.3294	0.3095	0.0009**

Table 10. Mixed gender pair and group scientist characters' gender-related traits. Junior status for women relative to men is coloured red.

Narrative function	*Character*	*Women's place in hierarchy*	*Number of prominent women on team*	*Number of prominent men on team*	*Highest ranked woman in senior position*
Scientist (noble)	Wheel crew	senior, equal	3*	4	2nd in command
	Medical staff	nurse not doctor	1	1	nurse
	Caris & Deedrix	equal	1	1	-
	Range & Norna	junior	1	1	-
	Hospital staff	junior, equal	2†	2	-
Scientist (villain)	Ingram & Stu	senior	1	1	lead researcher‡
	Krillitanes	peripheral	0	2	-
	Impossible Planet	equal	2	4	science officer
	Hartman & Torchwood	senior, equal	2	2	director
	42	senior, equal	3	4	captain
Villain with non-scientific ambition or motive	Kaftan & Klieg	less prominent	1	1	-
	Winters & Jellicoe	senior	1	1	director
Foolish scientist	Garrett & Clent	junior	1	4	-
	Dulcians	junior, equal	1	2	-

* including companion Zoe and second in command Corwyn, the latter also included individually in Table 9
† including companion Martha
‡ actually junior to the Master

shifting Eldrad (*The Hand of Fear* (1976)) as female because she spends most of her time and performs most of her science in female form. I also listed the transgendered Cassandra (*The End of the World* (2005) and *New Earth* (2006)) as female in accordance with the actor who played her and the pronoun used to refer to her.

Table 9c summarises the statistical differences between the genders. Most of the criteria are rather subjective traits to measure, so these statistics should be treated with caution, but they are useful for giving an estimation of tendencies in representation. Because they are more indicative than definitive, I have restricted my statistical methods to percentage comparisons and t-tests. All p-values are based on double-sided t-tests testing the difference between the proportion of female scientists who possess a trait against the equivalent proportion of male scientists (see Table 9c for explanatory details).

Overall, the difference in numbers of female (36) and male (131) scientists is statistically significant ($p < 0.0000$). This is the most striking problem for equality in *Doctor Who*. Numbers of female scientists fluctuated throughout the program (Figure 7a). In the original series they were fewer in number than male scientists in a ratio of 1:4, which is more or less consistent with previous findings that 82-85% of scientists in movies are male (Flores, 2002; Weingart et al., 2003). In *Doctor Who* this is in part because the numbers are dominated by baddies, many more of whom are men (Figure 7a, Table 9b). In the new series the numbers evened out considerably, with women slightly outnumbering men. Consistent with Flicker's (2003) observations about scientist stereotypes, the numbers only approach gender parity for the morally ambivalent 'foolish' and 'victim' or goodie 'noble scientist' stereotypes, not for Haynes' (2003) villainous stereotypes (Figure 7b).

When considering a character's primary narrative function, men are statistically more likely than women to function as 'scientist' ($p < 0.005$). Both women and men sometimes function as villains or victims with a non-science agenda or as freedom fighters as discussed in Chapter 6. Several women and no men function primarily as love interests (Dawson, Petra Williams, Vira, Lamia, Redfern). Both women and men function as 'consorts' to powerful men, drawing attention to those men's greatness or specialness and caring for them, including the Doctor (River Song, Jackson Lake), the Master (Chan-Tho), and others (Hame, Laurence Scarman).

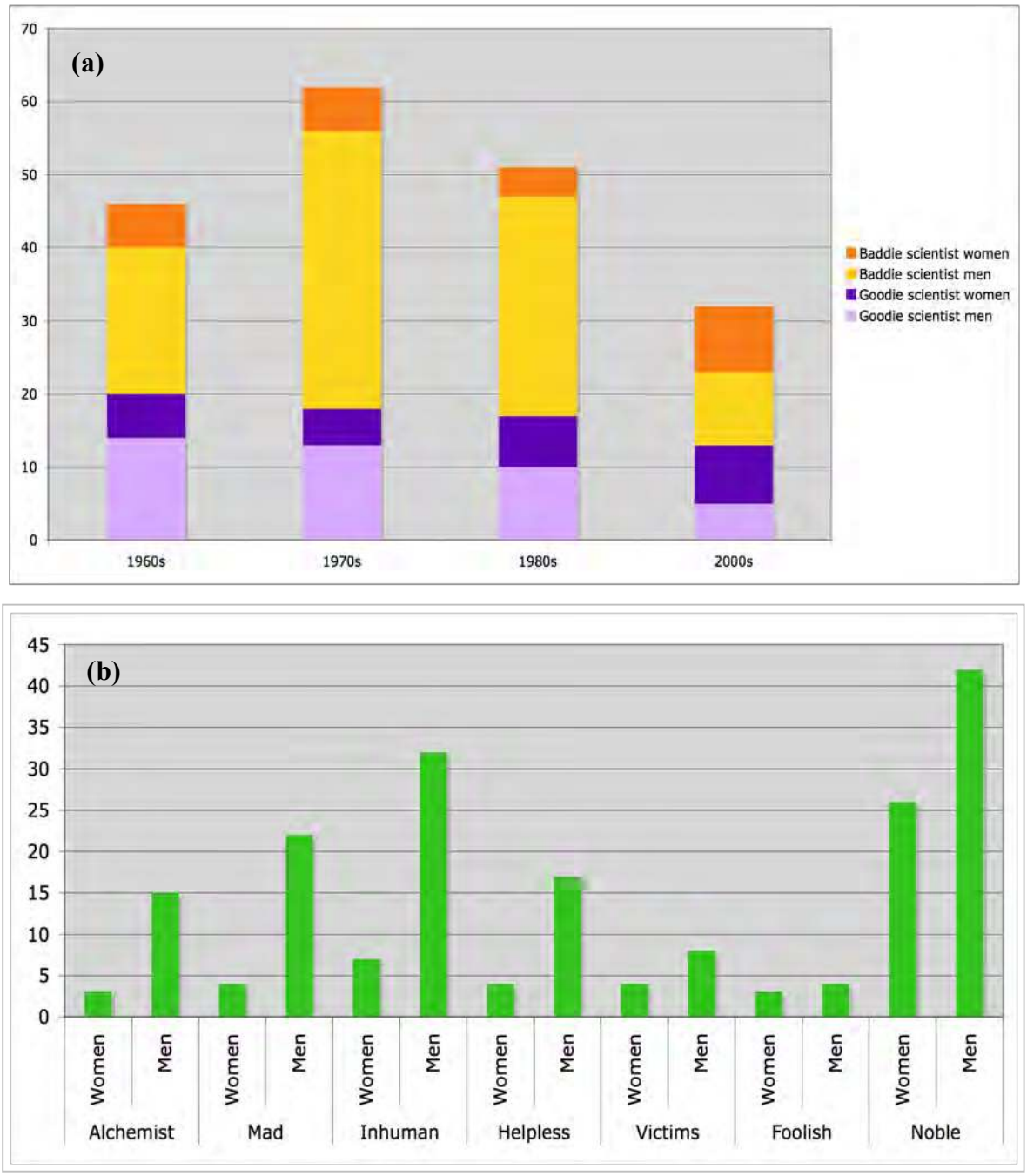


Figure 7. Trends in female and male casting of scientist characters, based on the characters in Table 7. (a) Proportions by decade, split into goodies and baddies. Goodies are those classified as 'noble scientists' and baddies are the rest.
(b) Proportions by stereotype across all decades.
'Women' categories include pair and group characters that have at least one female member. Pair and group characters do not count more than once (for example the *42* crew count only as one character), which means that men in mixed gender pair and group characters are not counted in the 'men' categories. For example the Krillitanes count only in the baddie women category even though their casting is dominated by men. This means the graphs slightly over-represent the relative incidence of women. Three characters are explicitly not gendered despite voice actor casting choices (being non-vertebrate) so have been excluded from this and all gender-oriented figures and tables (the crab-like Macra, the crystalline Krotons and the computer Xoanon).

Men are significantly more likely to perform science on screen ($p < 0.05$) and to possess recognised expertise ($p < 0.05$). The statistical significance of this disappears when looking only at the subsets of functionally 'scientist' or 'other' characters, but partly this is because the already low number of female scientist characters is rendered even smaller, making statistical inference unreliable. Nonetheless, female 'others' are far less likely to perform science than male 'others' (52% vs 69%; for this and all percentages to follow, women are listed first) whereas 'scientist' characters are more evenly matched (80% vs 89%). Recognised expertise is relatively high for all characters regardless of primary function but the gap between genders is maintained ('scientists' 87% vs 98%; 'others' 76% vs 87%).

Women are moderately more likely to look like scientists than men ($p < 0.1$; 56% vs 39%), but when considering functionally 'other' characters this difference becomes striking ($p < 0.001$; 57% vs 13%). The female love interest and consort characters have a big impact on these statistics since they all (100%) look like scientists. In some cases looking like a scientist is the only thing that grants these characters any scientific credibility at all, and so is tokenistic. Novice Hame (*New Earth* and *Gridlock* (2007)), for example, is on the list of scientists because her profession is ostensibly 'nurse': she works at a hospital with other nurses and wears a similar nurse-nun uniform to them. However, she performs no science, has no autonomy or authority in her work, no notable expertise, and her title 'Novice' signifies junior nun rather than anything scientific. Her function is primarily to care for the powerful Face of Boe, who is dying in *New Earth* and keeping a city alive in *Gridlock*, but in this role she only performs emotional pastoral care not rational science. Male villains or victims with non-science agendas also have a big impact on the statistics, because the vast majority of these (91%) do not look like scientists at all. This statistic is consistent with other scholars' observations that men present diverse versions of what a scientist is whereas women tend to portray scientists 'straight'. Where female scientists break this mould in *Doctor Who*, it is often in a strongly feminised way. For example, in the new series, the Carrionites resemble witches (*The Shakespeare Code* (2007)), Hame's colleagues the Sisters of Plenitude are nuns (*New Earth*), Cassandra is a plastic surgery addict obsessed with losing weight and being beautiful, and Foster mimics television's "Supernanny" (*Partners in Crime* (2008)): all are scientifically skilled, but resemble female stereotypes, not scientists.

There are no significant differences between genders in terms of possessing authority and autonomy in the workplace. ‘Scientists’ are particularly evenly matched (87% vs 89%), though ‘others’ are less so (62% vs 74%), with female love interests and consorts least likely of any category to carry authority and autonomy (38%).

There are no significant differences between genders in the use of gendered/non-specialist or specialist titles, regardless of which set or subset of characters is tested. This is because of the surprising (to me) number of male scientists addressed as ‘Mr’ or similar (18%), which statistically if not absolutely balances out the large number of female scientists addressed as ‘Miss’ or similar (29%). Trends for these titles by decade are graphed in Figure 8. They show that the allocation of specialist titles was fairly even across genders in the 1980s and 2000s, after male-dominated earlier decades in which only one female character had a specialist title. In the 1970s, the scientist characters were dominated by specialist-titled men (42% of all characters). Gendered/non-specialist titles are allocated reasonably evenly across decades, although in the 1980s only one half of a paired character bore a female gendered title (Williams of the Jensen & Williams pair). This trend of increasing use of specialist titles for women is consistent with Jones’ (2005) observations of the use of ‘Miss’ not ‘Dr’ since the films he studied were from the 1950s and '60s.

Table 10 (p. 239) shows that in mixed-gender pairs or groups, women played a senior role as often as a junior one. There were often more prominent men than women, in agreement with Steinke (2005), but group characters from the new series (*The Impossible Planet* and *42* crews, plus Hartman & the Torchwood crew) were far better at gender parity in this regard, containing female characters who were complex and interesting as well as scientifically credible. These group characters were also multi-ethnically cast as were the Krillitanes (*School Reunion* (2006)) and the hospital staff from *Smith and Jones* (2007), and as such are more inclusive than the multi-national (but largely white) group characters of earlier decades. Haran *et al.* (2008) note that ensemble casting facilitates greater complexity, diversity and equality of characterisation. The new series also cast non-white women in individual scientist roles in a first for the program, including in the roles of Tosh Sato, Chan-Tho, Dee Dee Blasco and Magambo.

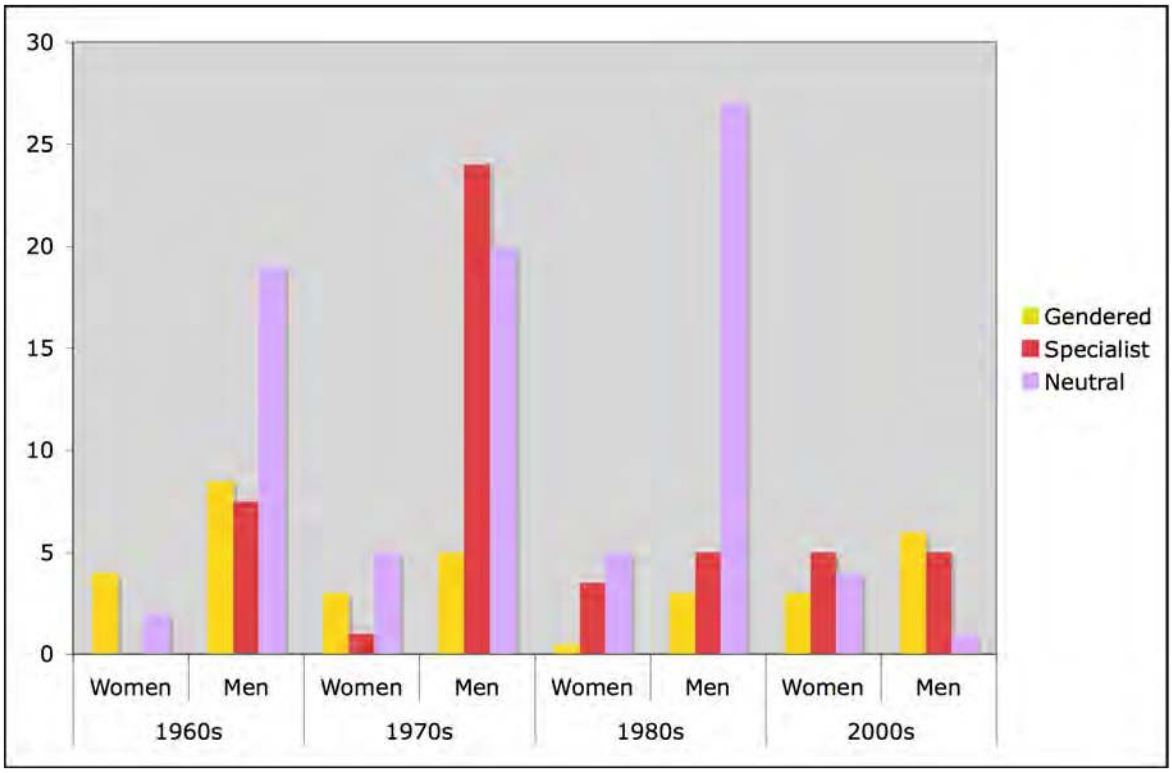


Figure 8. Trends in the titles given to scientist characters, by gender and decade (corresponds to Table 9). 'Gendered' refers to gender specific and non-specialist titles such as 'Miss' and 'Mr'. 'Specialist' refers to scientific or other specialist titles such as 'Professor' or 'Dr'. Neutral signifies no title has been used. Mixed-gender pairs and groups and foolish scientists are excluded.

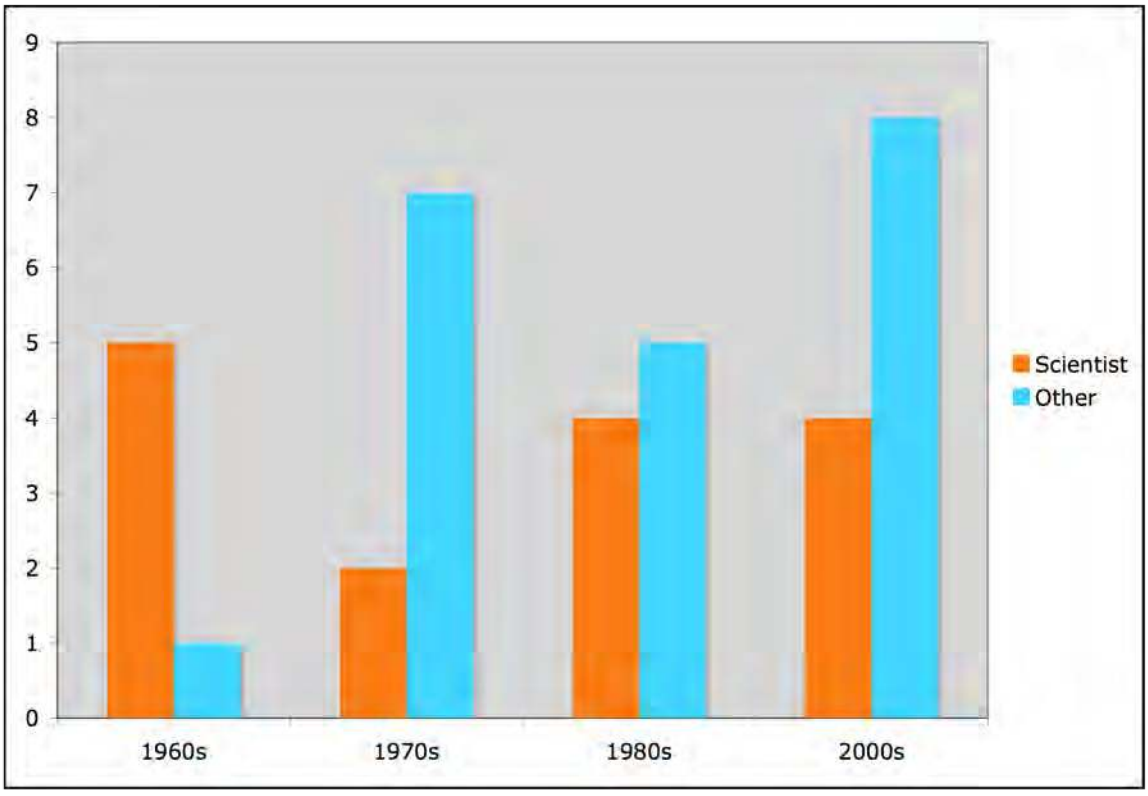


Figure 9. Trends in the primary narrative function of female scientist characters, as 'scientist' or 'other', the latter including villains or victims with non-science agendas, love interests and consorts to powerful men, and freedom fighters (numbers based on those in Table 9.)

In sum, female scientist characters in *Doctor Who* were more likely than their male counterparts to fulfil the role of scientist only tokenistically, with a narrative function that moved them away from science and away from specialisation, if indeed women were present at all. Gender parity increased from the 1980s onward and especially in the new series, although the love interest or consort function for women still dominated women's characterisation in the new series (Figure 9). Despite having fewer female scientists in absolute numbers, the 1960s was the decade most likely to see women in a non-tokenistic, purely 'scientist' function (Figure 9). When their primary narrative function was 'scientist', most female scientists, like most male scientists, were marked by multiple signifiers of credibility, including performing science on screen, having autonomy and authority in the science workplace and possessing recognised expertise.

Space forbids a detailed discussion of individual non-regular female scientist characters. This is a shame, because within these numbers lurk characters of great interest to the theme of equality, notably a number of very positive role models from the 1960s (Anne Travers, Megan Jones, Corwyn, Kelly); the most scientifically credible of all Time Lords, the Rani, from the 1980s; and three characters across decades who break the convention of casting unrealistically young women as senior scientists (Rumford, Jensen, Docherty)[57]. While *Doctor Who* does not treat female and male scientists equally, it would be incorrect to argue that it has ignored calls for gender parity in the science workplace. Throughout its history, *Doctor Who* has depicted scientist characters actively resisting sexist attitudes (Anne Travers, Ingram, Rodan, and companions) even if this was done in a hamfisted way. It has never explictly given biology as a reason for women's absence from science or relative subordination to men, so its overt rhetoric has been overwhelmingly in favour of workplace equality.

On the other hand, the foregrounding of emotional, relational and sexual traits in women is linked to gender expectations that are seen to be fixed and 'natural', and this emerges in characterisation regardless of protests against workplace inequality. Gia Kelly (*The Seeds of Death* (1969)), for example, is a supremely confident engineer,

[57] The 2009 episode *The Waters of Mars* is outside of my defined dataset but features Captain Adelaide Brooke, a female scientist aged in her late 50s or early '60s who holds the lead post in humanity's first colony on Mars. In addition to being a welcome addition to the ranks of (older female) scientists, Brooke directly challenges the Tenth Doctor's authority in a way that no other character has done, causing him to question whether he has behaved unethically and used his power to commit wrongs. As with Pertwee (see Chapter 5), this solitary challenge and resultant self questioning signals the beginning of the end for Tennant's Doctor, who regenerates in the next serial *The End of Time* (2009-10). Brooke's crew is also diverse in gender, ethnicity and nationality, like the other new series crews.

expert at her main job and adaptable to other tasks, carries authority, looks like a scientist, but in her opening episode is shown to be feminine after all, when her male colleague remarks, "In your case Miss Kelly, efficiency and charm go hand in hand." This relatively inoffensive example suggests that even if *Doctor Who* does not actively exclude women *qua* women from participating credibly in science, it nonetheless reproduces sexist ideologies, and these locate the source of scientific credibility in essentialist gender norms and patriarchal modes of social organisation. The same ideologies are responsible for the pathologisation of gender non-conforming characters.

In the next section I investigate gender parity in the representation of scientist companions. I show that they face a similar problem in that sexist ideologies dog their representation sometimes even if there is no blatant gender inequality in their relative credibility as scientists.

Equality among scientist companions

In this section, I compare the representations of the most 'science-oriented' of the female companions (Zoe, Liz, Romana, Nyssa, Martha) and male companions (Ian, Harry, Adric and Adam) formally trained in science (Table 1, p. 98). Peri and Mel, though completing some training as scientists, tended to fulfil other functions in the program, with Peri frequently being kidnapped or lusted after by baddies, and Mel playing a more generalist helper role to the Doctor. This in itself may constitute evidence of the program's inability to take women seriously as scientists, but since there is no requirement for companions to be scientists, it may merely be evidence that these characters were needed for other dramaturgic purposes. Peri was a botany student who wanted a holiday, not a professional scientist, so science was never her passion, and since Mel was not granted a proper introduction on the program (simply appearing as the Doctor's next companion in *Terror of the Vervoids* (1986), which was part three of the discontinuous *Trial of a Time Lord*), her passions and qualifications and even her profession were never well defined. Mel's participation in scientific tasks, most visible in *Time and the Rani* (1987), resembled more that of the companions from humanity's future such as Vicki, Steven and Jack in being a rather generic manifestation of techno-literacy rather than skill in a specialised field. It is made clear in dialogue that

computers are her speciality, but this does not have significant consequences for her actions.

It is clear from Table 1 (p. 98) that there were more female scientist companions (7) than male scientist companions (4). However, there were more female companions (22) than male companions (13), so proportionately the numbers of scientists were about even (32% vs 31%). When the techno-savvy and techno-skilled companions are included as scientists, the balance tips slightly in favour of men (55% vs 62%).

As noted in Chapter 3, scientifically oriented companions were seen as a problem by *Doctor Who*'s producers because they did not fulfil the traditional function of a companion: to ask for clarification on complex scientific matters. Tulloch and Alvarado (1983) describe how scientist companions tended to evolve into more conventional companions over their tenure — either becoming screaming women or action men — or else were eliminated and replaced. They quote actor Wendy Padbury describing Zoe's decline from scientist to screamer; note the 'sacking' of Liz for being too smart; declare Romana the Doctor's inferior despite her intelligence because she was "solipsistically 'bookish' and lacking his 'experience'" (214); and state that the potential for a female companion to equal the Doctor was entirely erased under Nyssa. They equate Ian with techno-savvy or non-scientist companions Steven, Ben and Jamie because all ended up serving a "running and punching" role (229) alongside Doctors too frail (Hartnell) or unwilling (Troughton) to fight. They suggest that both Harry and Adric fail as companions. Harry fails because he is "little more than [a cypher]" in the presence of "active" female companion Sarah (229). They suggest that Adric played dual functions as the inexperienced boy-child and the rational scientist counterpart to the Romantic hero Doctor, and argue that with the advent of Davison's Doctor, Adric was pushed more surely towards the child role, leading to his demise. In essence, although their analytical agenda is different from mine, Tulloch and Alvarado suggest that the show's representations of scientist companions *as scientists* largely failed regardless of gender because all of these characters were pushed away from science or remained scientifically subordinate to the Doctor.

I do not entirely agree with this assessment, perhaps because the criteria I consider important are different from theirs. In the following I show that some of these characters — Zoe, Nyssa, Adric — retain their scientific credibility throughout their tenure and

can and do function as the Doctor's equal as scientist. By the same token, I agree that the scientific orientations of Ian, Liz, Harry and Romana (particularly in her first season), as well as new series companions Martha and Adam, were rapidly exchanged for alternative functions. Critically for equality, the direction of transformation in all cases was along gendered lines. This is in essence the same story as that of the non-regular scientist characters: characters remaining within the scientist function were generally able to sustain credibility across gender lines, but once they moved outside of this they quickly adopted stereotypically traditional traits of their gender. This was generally bad for women since their traits were dependence, invisibility, fearfulness and/or subordination, which means the female scientist companions' primary narrative function became underused generalist assistant (Liz, Romana), damsel in distress (Romana) or Doctor-worshipping prophet (Martha). In contrast, the male scientist companions were able to maintain prominence and autonomy in realms outside of science, as 'runners and punchers' (Ian, Harry) or a villain (Adam).

On that note, it is no coincidence that all but one of the non-scientist male companions began as military personnel of one sort or another (Steven, Ben, Jamie, the Brigadier, Benton, Yates, Harry, Jack, and possibly Turlough, with Mickey the glaring exception), so possessed 'natural' leadership qualities and useful skills. Ian similarly filled a formal role of champion warrior in at least two serials (*The Aztecs* (1964) and *The Crusade* (1965)). By comparison, only three female companions were soldiers or warriors (Sara, Leela, Ace as a self-trained explosives expert), while four women and one man had non-scientific and non-military skills that proved useful 'in the field' (Barbara, Sarah, Jo, Donna, Mickey). Many of the female companions lacked a specialisation or profession (Susan, Vicki, Victoria, Katarina, Dodo, Rose, Jackie) compared to one man (Turlough), and the remaining two companions were unable to usefully apply their professional skills on their adventures so were effectively unspecialised (Polly, Tegan). There is enough diversity in this set of characters to preclude an outright condemnation of *Doctor Who* as sexist, but it is clear that societal sexism was reproduced in the development of these characters, particularly in the number of unskilled women. Unskilled status is not in itself a problem — there is no reason why Rose who works in a shop should not travel with the Doctor as much as the next person — but in all these cases the characters fell into stereotypically gendered behaviour patterns as revealed by the way they left the program. Last moments for the women were romantic, passive or emotional: Susan and Vicki were both in effect the Doctor's children and left to get

married; Katarina died in an act of self sacrifice after 5 episodes of doing little; Dodo simply no longer appeared without saying goodbye (and after doing little); Polly and Ben left together with the Doctor's injunction that "Ben can catch his ship and become an admiral and you, Polly, you can look after Ben"; Tegan left the TARDIS in distress after "too many good people [had] died"; Rose was last seen kissing a clone of the Doctor and Jackie was by her side with her own husband and second child. Turlough, in contrast, left after contacting his home planet, revealing his important rank and controversial political status there. Some of these characters were more active than this sounds — Polly, for example, invented a weapon against the Cybermen in *The Moonbase* (1967) using her experiential knowledge of the chemistry of nail polish remover — but it illustrates the point that gender stereotypes *in general* are the biggest problem for equality in *Doctor Who*, not sexist treatment of scientist characters as such.

To present a convincing argument that this is the case, it is necessary to demonstrate that the scientific credibility of both female and male scientist characters was either undermined or bolstered to equivalent extents. I establish this in the remainder of this section.

I happen to be a doctor - remember? - Liz

Liz was only in four serials (1970) but began her tenure in *Spearhead from Space* in highly competent fashion. She was the most highly qualified of any companion, having been forcibly seconded to UNIT from her research program at Cambridge to act as their scientific advisor in the Doctor's absence. The Brigadier described her as a meteorite expert with degrees in "medicine, physics and a dozen other subjects". She had a sharp, skeptical scientist's mind, arguing with the Brigadier about the existence of aliens, asking why the Earth would be more likely to be invaded by aliens now than at any other time in history, and disbelieving his report that two showers of meteorites landed at the same place, citing the statistical unlikelihood of the event. The idea that the TARDIS is a camouflaged spaceship was ridiculous to her, and she cracked sarcastic jokes about it: "I deal with fact. Not science fiction ideas." Liz knew her way around computers and laboratory equipment, she was adept at chemical analysis, isolated faults in the TARDIS console, and was invited by the Doctor to communicate with an alien species at the end of *The Ambassadors of Death*, with the statement, "Here's Miss

Shaw, she's much more practical than I am." At the end of *Spearhead from Space*, it was Liz who was the hero, when she repaired a complex electronic weapon that she built with the Doctor, thus saving his life and preventing an alien invasion.
It was all downhill from there though. In her second serial, *The Silurians*, when investigating strange happenings at a nuclear reactor, the Brigadier assigned the Doctor to tackle "the purely scientific angle", and relegated Liz to the task of looking into issues with personnel, a task she believed was inappropriate to her skills. When the Brigadier led an investigative party into nearby caves, she was not invited: "We'll all go. Except Miss Shaw," he said. She protested, asking if he has never heard of "female emancipation", but if he had, we never find out, because the Doctor backed him up, saying in a patronising tone and with no further explanation, "Liz. This time I think he's right." Later in the story a plague broke out, and the Brigadier asked Liz to 'man' the phones. "I am a scientist, not an office boy!" she protested, but once more the Doctor convinced her to do as she's told. Under these circumstances it was not possible for Liz to adopt a reflexive attitude to her science without losing her credibility altogether.

The big problem for Liz was the presence of the Doctor. When he was unconscious and absent from UNIT in the first two episodes of *Spearhead from Space*, she carried authority and expertise. Once he recovered, he assumed the lead in the UNIT lab and instantly infantilised her with forced familiarity, addressing her as Liz or as 'my dear' or 'my dear girl' instead of even 'Miss Shaw'. He inspected her research into the alien meteorites and soon proved his superiority with inferences about their nature that she failed to make. In *The Ambassadors of Death*, Liz was relegated the standard companion function of asking stupid questions so that the infallible Doctor looked smart. Pompous to the last, he snapped at her on multiple occasions when she questioned his requests, and she did what she was told without being given the courtesy of an explanation. The Doctor paid her compliments, but it was a controlling measure, and she was only granted agency with his permission: it was the Doctor who allowed her to be practical at the end of the story and communicate with aliens. He did not wait around to witness her work though, and we do not see it either. With a swift sleight of hand, Liz became the Doctor's assistant; no longer UNIT's scientific advisor, and far removed from acclaimed Cambridge research scientist.

The increasing invisibility of Liz's scientific credibility was accompanied by increasing 'feminine' characteristics such as screaming, wearing girlish clothes instead of a lab

coat, and being objectified by the camera: *The Silurians* opened with a shot of her from the waist down, wearing a miniskirt. Liz was never called 'Dr', always 'Miss'. This representative blindness about her qualifications reached its zenith in her final appearance, episode 7 of *Inferno*, when the Doctor was injured and she tended him. The Brigadier insisted on getting him a doctor, to which Liz replied, "I happen to be a doctor, Brigadier - remember?" The Brigadier's final remark — "Miss Shaw, I really think he needs medical attention" — may have been intended to imply that she was not a doctor of medicine, but certainly implied that he had no respect for her ability to make judgement calls.

Liz did not reappear in the following season, having decided (we are told) to return to Cambridge, but she did get the last word on herself. In *Terror of the Autons*, the Brigadier joked about Liz's departure to the Doctor, who insisted that he needed a scientist with Liz's qualifications to be his assistant. "Nonsense," said the Brigadier. "What you need, Doctor — as Miss Shaw herself so often remarked — is someone to pass you your test tubes and to tell you how brilliant you are."

I suppose you think we should be impressed by that too? - Romana

Time Lord Romana served as companion for almost three seasons (1978-81). Like Liz, she was companion to a dominant and arrogant Doctor who made few mistakes and habitually downplayed any mistakes he did make. This downplaying was intended to be humorous, but as is the case with many jokes, it was a woman who bore the brunt of it. It would take two and a half seasons for Romana to convincingly assert her authority and independence, and she left the series poignantly stating, "I've got to be my own Romana".

Romana was initially foisted upon the Doctor in *The Ribos Operation* (1978) to assist in a season-long search for a powerful object, the Key to Time, despite the Doctor complaining that he did not want a companion because he always has to protect and teach them. He immediately asked Romana if she could make tea and told her to stay out of trouble. Romana's attractive appearance and stereotypical femininity was highlighted when she brushed her hair in front of a hand mirror early in the serial. Her feminine dependence upon the Doctor appeared later in the serial when she clung to him

in danger. These traits were combined into sexualisation throughout her first season, with 'humorous' scenes involving the Doctor lying on top of her to avoid danger. The Doctor explicitly remarked upon her good looks in *The Pirate Planet* (1978) in an irrelevant context, and other characters — even, disturbingly, K-9 — made similar comments in this and later serials. Romana enjoyed getting frocked up in several serials and wore notably impractical shoes, including stilettoes when walking in a bog in *The Stones of Blood* (1978), and twisting her ankle in *The Androids of Tara* (1978). All of these traits marked Romana, particularly in her first season, as stereotypically and tediously feminised: not merely female, but a sex object whose impractical girlishness and inexperience in the field the Doctor must tolerate, much like Flicker's (2003) 'naïve expert' stereotype.

Clearly this is symptomatic of sexist characterisation. The question though is what relationship that had to her characterisation as a scientist. Steinke's (2005) contention that attractive, feminine scientists might attract girls to science would suggest that Romana's fetishised femaleness might not be a problem for the democratisation of science. The problem is that Romana's femaleness was correlated with her deficiencies. The Doctor's bad attitude towards her encompassed both defensive slurs about her appearance ("good looks are no substitute for a sound character") and defensive jibes about her extensive academic qualifications, which were vastly superior to his (she graduated with a triple first while he barely passed on the second attempt) but which he considered essentially worthless ("I suppose you think we should be impressed by that too?"). He insisted she appreciate his brilliance and defer to his greater experience. When Romana read the TARDIS manual and made a suggestion for controlling it better, the Doctor tore out the page, insisting his 523 years experience piloting the TARDIS was sufficient. Romana in turn diagnosed him with a massive compensation syndrome. This seems a fair call, if rather an apolitical one resembling battle-of-the-sexes flirtation more than feminist critique.[58] In any case, since the Doctor carried greater rhetorical power, and was, after all, the hero of the story, and since Romana soon agreed that he was brilliant, her diagnosis did not stick. The Doctor continued to be childish and insulting towards Romana, while her admiration for him grew. In terms of role-modelling a positive relationship between experienced older male mentor and early career female scientist, this pair fared very poorly indeed.

[58] Haran *et al.* (2008, p. 21) describe the battle-of-the-sexes template thus: "This template uses heterosexual desire and the deferral of its consummation through verbal sparring and competition around professional achievement to displace struggles around gender and power (or hierarchy) to a more congenial register."

In Romana's second and third seasons and second incarnation, things improved somewhat for the better, although the oneuppersonship continued. The Doctor, for example, called Romana's own sonic screwdriver "a bit basic" and then tried to steal it (*The Horns of Nimon* (1979-80)). He patronised her when she noticed an important fact in *The Leisure Hive* (1980), saying, "You spotted that did you? Good," but when she countered this with another important fact that he missed, he asked why she's so competitive. While the upshot of this is that Romana was proved clever, it was a backhanded compliment because she constantly had to put up with the Doctor's arrogant and nasty attitude in the guise of humour. Again, this is not an ideal of inclusivity to which I aspire: backhanded grumbling about women's genuine achievements is simply unacceptable.

In terms of credibility, Romana did demonstrate substantial technical skill and scientific reasoning, even though she expressed these in a formulaic rather than creative and adaptive way and made naïve mistakes in helping scientist villains construct dastardly machines (*Nightmare of Eden*, *City of Death* (both 1979)). She relaxed into logical reasoning and technical confidence by her final two stories *State of Decay* (1980) and *Warriors' Gate* (1981), and in these stories the Doctor's praise for her intellect finally seemed genuine rather than backhanded, granting her long overdue recognition. It may be no coincidence that these fall in Tom Baker's last season, when he dropped his messianic persona and became fallible.

By these criteria, Romana's representation aspired to equality. The great weakness of her representation was that unlike Liz, she did not wield the language of feminist protest against the sexist harassment she constantly faced from the Doctor. This effectively endorsed oppressive dynamics between resentful, inferior male scientists and attractive, intelligent female scientists, perpetuating a masculinist culture of competition (Easlea, 1986; Keller, 1996b), rather than engaging with and challenging such dynamics.

My name isn't important - Martha

Martha was the Doctor's companion for the whole of Series 3 and parts of Series 4 (2007-08). When she first encountered the Doctor, she was a medical student. When they met again in Series 4, she was a fully qualified doctor and was working for UNIT.

Martha was at her most doctorly in her first serial *Smith and Jones*, shown doing rounds and making diagnoses, performing mouth-to-mouth rescusitation and CPR on the Doctor, engaging in scientific reasoning with him about the strange phenomena that occur in the story, and — believing he was a patient — wielding her doctorly authority to reassure him that everything will be fine. In later stories she performed mouth-to-mouth several times, fit a bandage, fixed a dislocated shoulder, lectured a woman on drug use while pregnant, and lectured a scientist on science ethics. In *Human Nature* (2007), set in 1913, when disguised as a maid and trying to convince a nurse that in the future she is a doctor, the nurse confronted her with racism and classism in one of the few times the program has engaged overtly with obstacles to equality aside from sexism, saying, "Women might train to be doctors, but hardly a skivvy and hardly one of your colour." Martha then proved her medical expertise by naming all the bones of the hand.

That was more or less the extent of Martha's scientific excursions. In her first appearance in Series 4 (*The Sontaran Strategem* (2008)), she examined an ill factory worker on behalf of UNIT, but her subsequent UNIT duties were more directly military in nature. This was particularly so in the finale *The Stolen Earth* (2008), when she was tasked with blowing up the Earth to save its people from suffering. This transformation from doctor to soldier was highlighted by Davros (alongside the transformation of the Doctor's other companions into soldiers throughout the new series) as a sign of the Doctor's hypocrisy given his pacifist and altruistic ideals. It was a major critique of the Tenth Doctor and had the potential to demonstrate fallibility in him, but he did not face punishment or shaming as a result — particularly not from the companions themselves — so he retained his unruffleable hero mystique. This was foreshadowed in *The Sontaran Strategem* when the Doctor abused a UNIT soldier for carrying a gun and disparagingly asked Martha if she had one too, a slight against her choice of employer. Martha retorted that he was the one who made her into a soldier, and framed her decision to join UNIT as a desire to make things better from the inside. Rather than admitting he was wrong or arguing the point as an equal, the Doctor saved face by asserting his controlling ownership of her, meeting her comment with a condescending "that's more like Martha Jones", as if it was up to him to determine who she can or cannot be. She replied, "I learnt from the best", endorsing his behaviour and re-asserting his faultless heroism.

Doctor to soldier was not the only transformation of Martha away from science. More interesting was her earlier transformation from scientist to John the Baptist-like religious zealot in the Series 3 finale *Last of the Time Lords* (2007). As noted in Chapter 5, Martha framed her transformation in terms that foregrounded the messianic Doctor and rendered herself invisible. This transformation of Martha was not sudden, since her character trajectory throughout Series 3 was away from the independent and rational scientist and towards the subservient and emotionally attached companion. Whereas in her second serial *The Shakespeare Code* she was unfazed by 16th century people throwing faeces from their windows into the street since she had "seen worse" having "worked late night shift A & E", by *Daleks in Manhattan* (2007) two stories later she lost this scientific cool and gagged at the smell emitted by a small piece of rotting Dalek (the Doctor does not). Her medical expertise had already been usurped by the Doctor in *The Shakespeare Code* when he took over from her mouth-to-mouth on a dying man, saying "leave it to me I'm a doctor", to which she could only reply, ineffectually, "so am I - near enough". The serial also showed Martha falling rapidly in love with the Doctor and being jealous of the recently departed Rose, highlighting her sexuality.

In echoes of Liz, the Doctor called Martha "Miss Jones" throughout Series 3. In one sense this was reasonable since she was still technically a student. Nonetheless it set up an unequal power dynamic between them from the outset, particularly pertinent given Martha's insistence in *Smith and Jones* that "you've got to earn that title" (of 'Doctor'), and given the dubious status of the Doctor's own doctorate as possibly honorary and decidedly unmedical (BBC, 2009a). His name for her did change to "Dr Jones" in Series 4 once she graduated, but even then she attributed her new title to the Doctor, since UNIT fast-tracked her qualification because of "experience in the field" with him.

A marked shift away from scientist came in *The Lazarus Experiment* (2007), when despite her scientific training and the centrality of science to the plot, Martha ended up another screaming companion who needed to be rescued. At the end of this serial, having been treated like a visitor to the TARDIS by the Doctor for several stories, she insisted that he grant her more permanent travelling companion status, and he symbolically gave her a TARDIS key. The handing over of the key was a turning point for Martha, after which time she became a 'believer' in the Doctor. In the next serial, *42* (2007), she again became trapped, functioning as a damsel in distress for the Doctor to rescue, and exhibiting unerring faith that she will be saved. She exhibited a succession

of stereotypically feminine and sexualised traits: screaming, crying, sentimentally phoning her mum, and kissing a bloke to try and make the Doctor jealous. These behaviours are understandable when one is faced with imminent death, but in this case they were also correlated with the symbolic shedding of Martha's independence and rationality and her adoption of a relational and dependent mode of being. The price of her "frequent flyer privilege" (her key) was compliance and subordination to the Doctor, a metaphoric marriage contract and a commitment to the church in which she must prostrate her needs to his. Despite leaving at the end of Series 3 to heal her unrequited love for him, in Series 4 this metaphoric marriage materialised in her literal engagement to a human doctor who was always travelling overseas and 'doing good'. Martha compared her fiance to the Doctor, noting the irony, as if for the rest of her life her every action — and notably, her every *female* action, signified by a huge diamond ring that is the subject of loving close-ups — was a tribute to him.

Effectively, despite Martha's great importance to fans as the long overdue first black woman to be a companion (neadods, 2007), and her active role as companion in her Series 3 finale, her potential as scientist role model was corrupted by the toxic Cult of Doctor. Before meeting him, Martha confidently donned the trappings of her profession including authority and expertise, but ultimately the only authority Martha wielded in her moment of greatest achievement was that of prophet shouting in the desert, preparing a road for the Lord, since He was much greater than she.

The unscientific male scientists - Ian, Harry, Adam

The narrative arcs of Liz, Romana and Martha are a problem for equality because their scientific credibility was trumped by the 'field experience' of a less qualified, overly confident male scientist who could do no wrong under the myth constructed for him. They could not win next to him. This amounts to poor role-modelling for female viewers, particularly for the 1970s serials, which had a dearth of female scientist characters in general and almost entirely lacked female scientists whose primary narrative function was 'scientist'. But there is some mitigation of the sexist nature of this in the narrative arcs of the male scientist companions Ian, Harry and Adam, since they too were shifted away from science towards other narrative functions.

Ian, as noted, shifted quickly to a 'running and punching' leadership role during his two seasons (1963-65), admitting in his first episode that the Doctor's granddaughter Susan "knows more science than I'll ever know". This did not entirely eliminate his scientific expertise though, which proved more useful than Susan's in several serials including *Marco Polo* and *Planet of Giants* (both 1964). It did not eliminate his authority either, particularly in historical stories, since somehow this tweed-wearing science teacher was able to defeat the Aztecs' champion warrior (*The Aztecs*), escape from slavery under the Romans (*The Romans* (1965)), and earn a knighthood from King Richard I (*The Crusade* (1965)). Much of his time was spent arguing with Hartnell's Doctor, and the Doctor's profound fallibility, discussed below, left plenty of room for him to shine. In this sense his tenure resembled Martha's, since both of them had substantial screen time but not as scientists. The primary difference between them was the gendered nature of their new roles and the relative independence from the Doctor that Ian was able to maintain compared to Martha.

Harry lasted just over one season (1974-5) and only seven serials. He was originally conceived of as something of an action hero in anticipation of the Fourth Doctor being an old man (Tulloch and Alvarado, 1983), but when the relatively young Tom Baker was cast, his character became more foppish and hopeless in the field, although he retained a basic 'masculine' ability to perform physical tasks such as defusing bombs. Harry was a naval surgeon, a career the Doctor gently mocked in *The Ark in Space* (1975) when asked if he has medical skills, saying, "my doctorate is purely honorary, and Harry here is only qualified to work on sailors". In *Revenge of the Cybermen* (1975), the Doctor became more nasty towards Harry when he made an understandable error, yelling to all within earshot, "Harry Sullivan is an imbecile!" Harry proved himself hopeless at espionage in *Robot* and spent most of *Terror of the Zygons* (1975), his final story as travelling companion, unconscious and imprisoned by the baddies. Harry only occasionally used his medical skills, and even then only as an adjunct to the Doctor, so drifted away from his scientist identity relatively quickly much like Liz and Martha. His narrative trajectory was indeed very similar to that of Liz, with his skills and ultimately his presence not needed when the Doctor was so very infallible and already has a more conventional companion in Sarah. Significantly for equality, Harry was old-fashioned and sexist, expressing surprise at a female world president (*The Ark in Space*) and constantly belittling Sarah's abilities, which drove her to prove him wrong. This equated sexism with hopelessness, particularly compared to the brave and

strong feminist Sarah, so contributed to the anti-sexist rhetoric in which *Doctor Who* engaged at the overt level.

Just like Romana, Adam received a taste of the Doctor's anti-intellectual tendencies in his short two episode period as companion (2005). When he discussed the possibility of using his collection of alien junk in a fight, the Doctor's disdain was merciless:

> Doctor: What - you in a fight? I'd like to see that.
> Adam: I could do!
> Doctor: What you going to do? Throw your A levels at them?

Once more, a scientist companion's rigid book smarts were shown to be inferior to the Doctor's experience. This did not eliminate Adam's scientific abilities, which he maintained to the last, but it did signal a shift in his narrative function. Adam was evicted from the TARDIS after stealing information about technology in the future that could make him rich in the present, effectively switching from 'scientist' to 'villain with non-scientific motive'. Adam seemed to retain his expertise and some autonomous ability to act outside of the Doctor's circle, differentiating him from Liz, Romana, Martha and Harry. But since he must surrender his place in the TARDIS for doing wrong, he, like them, must ultimately be subject to the omniscient Doctor's will.

In sum, the companion role in general seems to be largely unsuitable for scientists, particularly in the presence of messianic Doctors whose narrative function is to be brilliant and infallible. This applies to both female and male companions, but gender stereotyping easily slips in when characters move away from their specialisation, which means that women far more than men lose their expertise, independence and identity when they meet the Doctor.

This was not always the case, though. The examples of Zoe, Nyssa and Adric show that in the presence of a fallible Doctor, scientist companions could maintain their scientific credibility, beat the Doctor at science, and receive the Doctor's blessing for it.

Something of a genius - Zoe

The example of Zoe demonstrates that competitiveness between the Doctor and a companion does not have to amount to abuse as happened with Romana.

Zoe only appeared in eight serials (1968-69) but was a stand-out example of scientific credibility. Born in the 21st century, she was educated by a parapsychologist who pumped her head full of facts and figures but neglected her emotional capacity. This left Zoe extremely intellectually gifted, particularly in mathematics. As her space station colleague Corwyn quipped, "We use Zoe as our second opinion."

Zoe and the Doctor competed intellectually throughout their time together. Gentle banter and ribbing went hand in hand with mutual respect. This was most prominent in *The Krotons* (1968-9), in which the hostile aliens who feed on brain waves (see Chapter 5) drew smart people into their ship to their deaths by running intelligence tests through learning machines. Zoe sat the Krotons' hardest test in order to get into the ship and find their weakness. Her test result was more than double that of the best local student, amazing the local teacher, and causing the Doctor to explain, "Yes, well, Zoe is something of a genius, of course. It can be very irritating at times."

Zoe described the test as easy, and the Krotons invited her into the ship. The Doctor sat the test too, not wanting Zoe to go in alone, but needed her assistance to use the machine and then struggled with the questions, getting the first two wrong. The teacher expressed doubts about his ability to answer the advanced questions, but Zoe had faith, saying, "Of course he can! The Doctor's almost as clever as I am."

The Doctor eventually had reason to show off:

> Doctor: Yes. I think that's rather better. I think I've scored more than you have, Zoe.
> Zoe: You answered more questions. Besides, this isn't supposed to be a competition.

The risk with this competitiveness is that it could be tokenistic and condescending: the humour lies in Little Zoe beating Daddy Doctor in a test. However, these risks were

circumvented because both Zoe and the Doctor were consistently brilliant and fallible. The Doctor could not do everything, and his humorous egotistical boasts simply foregrounded her superiority in this field. Where he failed, Zoe could succeed. And vice versa: Zoe, like many companions, was sometimes blinkered by over-confidence borne of intellectualism, though in her case the Doctor was too. Tulloch and Alvarado (1983) are correct when they state (somewhat simplistically) that Zoe was the Doctor's scientific equal primarily because he also ran away in fear. Unlike Tom Baker's Doctor with Romana, Troughton's Doctor celebrated Zoe's achievements and routinely admitted his own failings: Zoe never had to prove herself to him.

The list of Zoe's achievements is impressive. In *The Invasion* (1968) she made a computer explode by feeding it an insoluble equation and laughed, nerd-like, in enjoyment of her skills. Later she found a flaw in the UNIT equipment for detecting the Cybermen's invasion fleet then proposed a chain reaction to destroy the fleet with just a few missiles. When the UNIT soldiers retorted that there was insufficient time to make the necessary calculations, Zoe did them with a pencil in 30 seconds. After the soldiers expressed doubt ("You'd better be right!" "I am."), Zoe effected a glorious victory:

Major: Every single one of them - knocked right out of the sky!
Brigadier: Exactly as you predicted. A chain reaction of explosions.
Major: Well it's fantastic! How do you do it?
Zoe: Well it's all quite logical really. Hardly any calculation needed at all. Except for simple stuff like speed, angle of descent and relative positions of the spaceships.
Major: Can't we keep her on, sir? She's much prettier than a computer.
(Everyone laughs.)

In *The Seeds of Death*, Zoe proved herself a competent astronaut in a rocket flight: as well as piloting the rocket with the Doctor and instructing Jamie, she calculated an emergency trajectory when the rocket ran into trouble. After a disaster in *The Space Pirates* (1969) when the crew lost the TARDIS, Zoe calculated where they could find it:

Zoe: There's no need to guess, Doctor. It's easy enough to work out.

Doctor: What?

Zoe: Applied mathematics.

Doctor: Applied . . . oh, I see. You've been messing about again, have you?

Zoe: *(Starting to crunch up the paper with her calculations.)* Oh well, if you don't want to know what I've discovered . . .

Doctor: *(Stopping her.)* Oh no, no, no, no, no. Come along, surprise us.

Zoe: *(Showing him her calculations and a map.)* This was the position of our bit of beacon when Milo first saw us. I got the figures from the computer.

Doctor: Hmm.

Zoe: And this is our position eight minutes later when he docked along side.

Doctor: *(Muttering to himself as he double checks the figures.)* Mmm . . . Yes, go on.

Zoe: Well, from this data, it was simple enough to work out our original position and course. D'you see?

Doctor: Yes, except that after my little experiment we veered rather violently off that course.

Jamie: Ah yes . . .

Zoe: Yes, but I allowed for that. Look!

Doctor: Oh . . .

Zoe: Electromagnetic waves are always at right-angles to the direction of propagation, and, as you know, travel at a hundred and eighty six thousand, two hundred and eighty two miles per second.

Doctor: *(Looking proud of Zoe but also a little lost.)* Do they really? How interesting. Well, what's the answer?

Zoe: Here!

Doctor: What?

Zoe: If we'd stayed on our original course, the TARDIS would have landed within ten miles of where we are now. Except of course, we'd still be up there because we weren't travelling quite so fast.

Doctor: *(Excited.)* Well, Bless my soul! Yes, of course. Yes, as you say, a simple calculation. I should have thought of that myself!

Zoe: Yes. I wonder why you didn't.

As with most of the female characters, Zoe was treated with some sexism, but (almost) never from the Doctor. The exception was when she was asked to make tea in *The Space Pirates* while the Doctor, Jamie and their rescuer Milo sat around doing little: a request that dogged many a female companion (notably Polly) over the years. The "prettier than a computer" remark was an unfortunate sexist blot on Zoe's moment of greatest achievement. She on occasion screamed at danger. Most provocatively, she was sexualised by her lycra and leather costumes. In one infamous scene from *The Mind Robber* (1968), Zoe lay on the TARDIS console as it floated in space, wearing a sparkly catsuit, with her backside in prominent slow motion mid-shot. Usually Zoe did not respond to these insults, but she actively resisted sexism from the Brigadier and Jamie in *The Invasion*, showing it to be both a reality of women's lived experience and something that should properly be fought.

Importantly though, Zoe's adoption of 'feminine' traits or traditionally female roles was not correlated with a loss of scientific credibility. She also maintained her function as scientist through to her penultimate adventure, *The Space Pirates*. In these respects, she presented a far more positive role model for equality than Liz, Romana and Martha.

You're the expert - Nyssa

Nyssa's tenure ran to 13 serials (1981-83), in most of which she exhibited technical competence and in some of which her scientific abilities shone brightly. Like Zoe, she held her scientific credibility to the end, and went one better in leaving the TARDIS to pursue important scientific work in *Terminus* (1983).

Partly her technical competence was linked to her alien origins on a scientifically 'advanced' planet. She possessed a breadth of knowledge about astrophysics, antimatter, materials science and other fields. She was competent in applied maths, although she admitted her mathematical competence was not as great as Adric's, and

could understand the TARDIS controls, but admitted she could not pilot it without difficulty. Her skills were not merely generically 'advanced' though, because she was a scientific specialist: she claimed expertise in cybernetics, was branded a specialist in bioelectronics by the Doctor, and in her final serial *Terminus*, he deferred to her skills in biochemistry, calling her "the expert" when analysing the chemical Hydromel (see Chapter 5). Like Zoe, she was unself-consciously a science nerd, shown synthesising an enzyme in her bedroom for fun and practice. Tulloch and Alvarado (1983) are wrong to suggest Nyssa was not the Doctor's equal if scientific credibility is the criterion.

In contrast to other female scientist companions, Nyssa lacked self confidence in a number of serials despite her skill. For example, in *The Visitation* (1982) she built a sonic device from scratch that destroyed a lethal android, but displayed doubts throughout the process: first arguing with the Doctor's idea to build the machine, then wishing the Doctor was there to help her build it because he knew more about it. Regardless, the Doctor told her she was more than capable and sure enough she succeeded. Her youth partially explained this self doubt, as she was characterised as "a girl" in opposition to Tegan, who was "a woman". In terms of its significance for equality, her self doubt made her an accessible and likeable character, and made it seem all right to be female and to have doubts without losing credibility. In this way she contrasted with Romana, who had to battle all the way and never exposed intellectual weakness to the Doctor's hostility. Alternatively, this trait may have suggested that doubts were the appropriately humble way for women to be scientists. If so, this was redeemed in *Terminus*, when she displayed no doubts about her abilities and confidently claimed a role as a professional scientist in the most difficult of circumstances.

Nyssa's strength was applied science rather than innate gifts and theory. Thus she came across as less naïve than Zoe and Romana, and in that sense struck less of a contrast with the 'experience-based' Doctor. In *Castrovalva* (1982), when the Doctor was out of action from a nasty regeneration and Adric had been kidnapped, Nyssa effectively substituted for the Doctor in explaining to Tegan and hence to viewers the vast quantity of technical material in this science-rich story. In many ways she played technical backup to Davison's Doctor: she was a quiet achiever, working away on vital scientific tasks in the background, while he played the tortured idealist and engaged with questions of morality instead of science.

Nyssa possessed all the necessary traits to garner scientific credibility: abundant skill, recognition, comfort with scientific language and equipment, authority that was well earned, and humility within that authority. She never stopped being curious, never stopped using her science, and although screaming regularly in almost every serial and stripping down to her slip-like underwear when ill in *Terminus*, was rarely feminised in other ways. As with Zoe, her 'feminine' traits were not correlated with the loss of her science. The one occasion she was forced to defend herself against sexism was in a rather silly argument between Adric and Tegan when they were waiting for the Doctor in *Four to Doomsday* (1982):

Tegan: And what do we do in the meantime?
Adric: You could always read.
Tegan: Read?
Adric: Yes. There's a fascinating book on maths through there by a chap called Bert Russell.
Tegan: Maths?
Adric: That's the trouble with women. Mindless, impatient and bossy.
Tegan: You chauvinist. I heard that.
Adric: You were meant to.
Nyssa: I heard it too. You mean this?
(She shows him a dense book she's reading.)
Nyssa: Mindless?
Adric: Well yes. But you're not a woman.
Nyssa: I'm not?
Adric: No. You're only a girl.

Despite Adric's cardboard cutout sexism, he was not a credible complainant because in this serial his naïve and arrogant self interest and egotism ended up endangering all their lives. This interaction was therefore significantly less harmful to equality than the Third Doctor endorsing the Brigadier's decisions to exclude Liz from activities implicitly because of her gender.

The 1980s shift in the program towards politics and away from science opened opportunities for companions' diverse abilities to shine, rather than pitting them against

the eternally correct Doctor of the '70s or making them subservient to him. The presence of both Nyssa and Adric may help explain why Davison era serials showed fewer scientist characters actively performing science (Chapter 6). Adric was similar to Nyssa and Zoe in being the top expert in his field of mathematics, possessing gifts that were useful to both the Doctor and to villains. He was far from perfect, making naïve mistakes like Zoe and Romana and occasional sexist remarks like Harry, but he retained an identity as scientist during his two seasons and 11 serials (1980-82), despite what Tulloch and Alvarado say. He used his science skills in many stories and died using his science to save the Earth. There may be an inequality in the morality of Adric and Nyssa — Nyssa continued to play the 'straight', goodie scientist to Adric's more morally dubious rationalist — but the two received an equally heroic send-off as scientists, the only time this has happened in the program.

One does not need to possess Zoe's skills in rocket science to see that a fallible Doctor is essential if companions are to be his equals. It is simple logic that if the Doctor is the best at everything, no one else can compete. The Doctors of Hartnell, Troughton and Davison all lacked the omniscience and omnipotence that made the Doctors of Pertwee, Tom Baker, Eccleston and Tennant infallible. They frequently flaunted their scientific imperfections, creating space for their scientist companions to be the best for a while.

In addition, if a work of fiction has a particular barrow to push that is embodied by the hero, then democratisation is not possible because that character must save the day to effect the barrow's appropriate ideological closure. Again, none of Hartnell, Troughton or Davison solely embodied their eras' barrows. 'Goodness' was the barrow they embodied, but not to the exclusion of others. Indeed all of them, particularly the first two, exhibited enough 'bad' behaviour to render their ethics questionable at times. This made room for non-scientist companions to be the best for a while too. The relationship between equality and franchise in the presence of a fallible Doctor is discussed in the next section.

Equality meets franchise: fallibility and reflexivity among scientist characters

The 'reflexive turn' in science communication (Chapter 2) demands that scientists cease privileging themselves and their profession in order to level the playing field between

scientists and non-scientists. Scientists are thus asked to surrender authority, to recognise diverse expertises, in short, to do scientific work without fetishing the trappings of 'the scientist' that have promoted science's social and political power. If these trappings are necessary to establish female characters' scientific credibility as discussed in the previous sections then the demand for reflexivity raises questions for equal representation. The personal vulnerability and 'defrocked' pseudo-laity inherent in reflexivity can *look the same* as the relational emotionality that can prevent female characters from being treated seriously as scientists.

In this section I focus on the 1960s Doctors and companions to show that while the scientific credibility of scientists is to some extent built on a contrast with their less scientifically gifted fellows, it is possible for scientists to exhibit fallible reflexivity without undermining their credibility. I show that fallibility in Hartnell's Doctor, Troughton's Doctor and Zoe made room for non-scientist companions Barbara, Steven and Jamie to win ideological victories in arguments about science, or at least to voice their protests to these scientists' scientific ventures and thereby inject contestation about science into serials.

I was dying to know that - the Troughton era

Although she was a strong woman and competent scientist, Zoe was also human, and a major theme for her character was learning to balance her genius with a contextual understanding of how things work in human society. In this sense, the humanist ideology of *Doctor Who* manifested as reflexivity about the role of science in society and human identity.

In her first serial, *The Wheel in Space* (1968), Zoe's colleague Leo picked on her intelligence, accusing her of being uncaring because of her clear-headed technical competence in times of danger. He remarked that she was "just like a robot" and a "proper little brainchild - all brain and no heart". This disturbed Zoe, who sought reassurance that she would not be thought of as a freak and turn out emotionally undeveloped. She began to doubt the value of her abilities. Her insecurities emerged as intellectual snobbery when she found a mysterious object encased in unbreakable plastic and wanted to see inside, and the Doctor found fault with her linear logical approach:

Doctor: Well, we can find out.

Zoe: How?

Doctor: With the x-ray machine.

Zoe: *(Laughing.)* Of course. Why didn't I think of that?

Jamie: Aye, why didn't you?

Zoe: Well, all I had to go on was the fact that hyperoxide is unbreakable. Why, I just didn't think of x-rays.

Doctor: Simple common sense works wonders sometimes, Zoe.

Zoe: *(To Jamie.)* Well, at least, you didn't think of x-rays. That would have been awful.

Zoe's insecurity is the central point of humour in the scene. Her fallibility and doubt make her likeable because her incredible intelligence seems less intimidating. Non-scientist Jamie was her foil though, and her success as a scientist companion was built at the expense of him. Within the conventions of *Doctor Who*, this prevented Jamie from being scientifically competent, because he was needed to fulfil the conventional companion function of asking basic questions. Although this is a pleasing gender role reversal, it was still elitist, and reflected other axes of power such as class, since Zoe was an elite-class space station dweller and Jamie was a poor, rural, 18th century Scottish Highlander.

This was not the end of the story, though, because Jamie held his own in the face of scientific elitism. When he first met Zoe, he mocked her unbridled jargon:

Jamie: What does this Wheel thing do up here anyway?

Zoe: Well, it has varied functions, but mainly it's a radio-visual relay for Earth, a half-way house for deep space ships, a space research station, stellar early warning station for all types of space phenomena and . . .

Jamie: Aye and ask a silly question.

Bill: That one comes all the way from Venus. Imagine that. All those millions of miles away.

Zoe: 24,564,000 miles at perihelion and 161,350,000 miles at aphelion.

Jamie: Oh, I was dying to know that.

The sparring between Jamie and Zoe in this story (*The Wheel in Space*) reached its peak in the final episode. When Zoe's logic failed her again, Jamie was momentarily pleased:

> Jamie: Oh, there's something that you don't know then?
>
> Zoe: There's too much I don't know. I was trained to believe that logic and calculation would provide me with all the answers. Well I'm just beginning to realise there are questions which I can't answer.
>
> Jamie: You're just not trained for an emergency like this.
>
> Zoe: Well, that's the whole point! What good am I? I've been created for some false kind of existence where only known kinds of emergencies are catered for. What good is that to me now?
>
> Jamie: Hey, we are not done yet you know.
>
> Zoe: And if we survive? What then, Jamie? Suppose that we do get ourselves out of this mess - what have I got left? A blind reliance on facts and logic?

This is reflexivity in action. Zoe exposes the authority of science to critique by Jamie and through him to critique by viewers. Jamie's response comprises both schadenfreude and sympathy, leaving questions open about the value of pure rationality. The scene did not signify the end of science and logic for Zoe — far from it — and this rendered the characterisation of Zoe as scientist balanced between credibility and reflexivity, since both scientific expertise and a willingness to let that be challenged were present. The critical difference between this scene and the defrocking of Liz in her 'office boy' tasks for UNIT is that here the *process* of reflexivity was demonstrated with all the pain and opportunity it presented for both Zoe and the subaltern lay person Jamie, whereas Liz was subject only to an *outcome* of a forced defrocking by powerful men. The challenges to Zoe's authority came with the nuance and political complexity inherent in dealings with members of the 'lay public', whereas the challenges to Liz's authority were monolithically imposed from above without any obvious good reason. If goals of equality and franchise are not to clash then demonstrating the process of negotiation is important. In addition, it is important to ensure the parties are not too far apart in the hierarchy of power and that there are potential benefits of the process for democracy.

Elitist use of scientific jargon was critiqued many times in the Troughton era. Jamie lost patience with an intellectual bore in *The Tomb of the Cybermen* (1967):

Jamie: You know it's just struck me. All the corridors in here are as light as day but there are no windows.
Haydon: Alpha maison phosphor.
Jamie: Eh?
Haydon: It's a lighting system that never goes out. Works by letting cosmic rays bombard a layer of barium —
Jamie: *(Baffled and annoyed.)* Oh, aye that, yeah.

The Doctor corrected Zoe's jargon-ridden language in *The Dominators* (1968), but in the same breath insisted that her scientific knowledge was valuable:

Zoe: Well the quarks use ultrasound. So presumably it must be a fuel capable of producing a high enough energy quotient to sustain an actifying complex of considerably sophisticated design.
Doctor: Yeah, it must be pretty powerful too.
Zoe: Yes, well that's what I . . . Well, if you don't want my help!
Doctor: Oh, I do I do I do, Zoe!

This era of the program preceded the 'Time Lord magic' developments of later decades, so exhibited PUS-style science communication principles of explaining science in plain language rather than using science to befuddle. This PUS orientation, however, led to mixed representations of lay people's proper relationship to science, because it carried within it the deficit model assumption that lay people are ignorant. On several occasions, Jamie's stupidity was pointed out in no uncertain terms, implying that his interventions into science were inappropriate. In *The Abominable Snowmen* (1967), the Doctor was unnecessarily nasty:

Jamie: Hey, Doctor, if you really want to capture one of these beasties, I have an idea which I think may just work.
(The Doctor's face falls at this.)

Doctor: Oh, Victoria. [...] I think this is one of those instances where discretion is the better part of valour. Jamie has an idea. Come along.

(The Doctor takes a puzzled Victoria by the hand and leads her away.)

In *The Dominators*, when Jamie proposed a plan to save the planet, the Doctor and Zoe initially dismissed it, but then realised it was in fact a winner. However, the Doctor was damning with faint praise: "Jamie, it's a brilliant idea! It's so simple only you could have thought of it." Jamie solved a problem in *The Space Pirates* only by throwing the requisite tool in frustration. His inference in *The Ice Warriors* that an alien came to Earth by spaceship was mocked by the Doctor: "Well he didn't come by Shetland pony." Even when he said what surely must be the right thing in *The Evil of the Daleks* (1967) — dismissing the theory of alchemical transmutation of base metal into gold as a "daft" "old wives' tale" — the Doctor proved him wrong, claiming scientists still consider transmutation possible in the 20th century. Ultimately then, '60s *Doctor Who* subscribed to a certain amount of intellectual snobbery.

Importantly, this was undermined by the fallibility of Troughton's Doctor. He rarely boasted of his abilities without it being followed by action that humorously contradicted the boast. He thus opened the doors to mockery, and companions let fly to great comedic effect, as in the conclusion to *The Underwater Menace* (1967):

Jamie: It's a fact, though, Doctor? You can't exactly control the TARDIS?

Doctor: Control it? Course I can control it.

Jamie: No, no what I meant was, can you not exactly make it go where you mean it to?

Doctor: If I wanted to. It's just that I've never wanted to.

Ben: Oh, yeah, I bet.

Polly: Ooow.

Doctor: Right! Just for that, I'll show you. Now, where shall we go? I know, let's go to Mars.

(The Doctor operates a control. The TARDIS lurches violently.)

Polly: Aaah! Doctor, what's happening?

Ben: Can't you do something?

Doctor: Do something? I seem to have done something. It's all your fault, wanting me to tamper with the steering. I'm very sorry, everybody, but I'm afraid the TARDIS is out of control!

Polly: Aaaaaaaaaa!

Similarly, in *Fury from the Deep* (1968), the Doctor's pronouncement that a helicopter was "a very primitive machine" that "should be easy to control" came back to bite him when he almost crashed it. The opportunity was there, then, for Jamie and other companions to wreak some karmic revenge, since the Doctor was as open to ridicule for his patchy ignorance as they were. In *The Abominable Snowmen*, the Doctor revealed his intellectual shortcomings within a particular context in no uncertain terms:

Jamie: Have you thought up some clever plan, Doctor?

Doctor: Yes, Jamie, I believe I have.

Jamie: What are you going to do?

Doctor: Bung a rock at it.

In *The Seeds of Death*, Zoe spoke for the majority of companions (and perhaps viewers) when the Doctor's *ad lib* approach to problems was successful, exclaiming with surprise, "So you really did know what you were doing?"

On a darker note, this fallible Doctor's actions were at times deeply questionable. The serial that most powerfully questioned the Second Doctor's methods was *The Evil of the Daleks*. In this story, the Daleks reflected that they have lost battles to humans and forced the Doctor to find 'the human factor' that they were missing so that they could incorporate it to become more powerful. To pinpoint the human factor, the Doctor tricked Jamie into undergoing a series of potentially lethal tests, and 'distilled' the traits Jamie used to succeed: courage, pity, chivalry, friendship, compassion and mercy. Many times, Jamie was almost killed. Once he was safe and had been told what was going on, Jamie became extremely angry:

Doctor: Well Jamie, the experiment's nearly over. I've had no sleep. I've been up all night, but it's been worth it.

Jamie: Ah, don't touch me!

Doctor: Now what's the matter?

Jamie: Anyone would think this was a little game.

Doctor: No. It is not a game.

Jamie: Of course it isn't, Doctor. People have died. The Daleks are all over the place, fit to murder the lot of us, and all you can say is you've had a good night's work.

Doctor: Jamie.

Jamie: No, Doctor. Look, I'm telling you this: you and me - we're finished. You're just too callous for me. Anything goes by the board - anything at all.

Doctor: That's just not true, Jamie. I've never held that the end justifies the means.

Jamie: Ach, words. What do I care about words? You don't give that much for a living soul except yourself.

Doctor: I care about life. I care about human beings. Do you think I let you go through that Dalek test lightly?

Jamie: I don't know. Did you? Look, Doctor, just whose side are you on?

That this very emotionally charged protest was given substantial space to emerge lends it legitimacy. It raised questions about science ethics but also about science governance, highlighting a problem with technocratic rule even when scientists appear to be on our side, and lending a dissenting voice to people who suffer at the sharp end of that.

I want no part of it - the Hartnell era

Jamie was not the first companion to protest the Doctor's cold and rational methods. Steven often bickered with Hartnell's Doctor about his approach to his "scientific researches". In *The Massacre* (1966), the TARDIS landed in Paris on St Bartholomew's Eve 1572, the day before the real life massacre of over 10,000 Huguenots by the ruling Catholics. At the end of the story, the Doctor invoked the Time Lords' golden rule of non-interference and refused to rescue a Protestant child befriended by Steven, much to Steven's disgust:

Steven**:** Oh no! You just sent her back to her aunt's house where the guards were waiting to catch her. I tell you this much, Doctor, wherever this machine of yours lands next I'm getting off. If your 'researches' have so little regard for human life then I want no part of it.

A further challenge came from the thoughtful Steven in *The Ark* (1966). When Dodo's common cold all but wiped out two races of people in the future, Steven asked the pertinent question, "Do you think this has happened before? That we've carried an infection from one age to another or even one planet to another?" The Doctor's answer was unsatisfying: "Oh, I don't want to think about it, dear boy. It's too horrifying." Far from a comfortable adventure in time and space, *Doctor Who* here revealed a sinister underbelly to ostensibly harmless scientific exploration and once more made room for lay people to raise objections to its risks. Steven's challenge was left unanswered, and there was no closure around the scientist Doctor's accountability for his impact on the universe. In effect, this eliminates the potential for didacticism on the matter and emphasises the vital importance of asking questions that may have no easy answers.

Despite Steven's futuristic technical abilities, in these and other respects he effectively functioned as a non-scientist companion. This was particularly clear in *The Daleks' Master Plan* (1965-6), when he travelled alongside pseudo-companion Sara Kingdom, who was from an era even further in the future than Steven and so possessed more 'advanced' scientific knowledge than he. For example, Sara mocked Steven when he suggested using 'gravity force' to solve a problem:

Sara: *(Laughing scornfully.)* What?
Steven: *(Belligerently.)* What's wrong with that?
Doctor: Too primitive, my boy. Too primitive and far too dangerous.
Sara: Gravity-force as a source of energy was abandoned centuries ago.
Steven: We were still using it!
Sara: Oh yes, and the Romans used treadmills.

Implied in this is the unavoidable advance of scientific progress and Steven's relative primitivism. However, as with Jamie, Steven's 'luddite' status provided an important

note of protest against technocratic elitism. Unable to fix a piece of complex technology that was endangering a technologically advanced ship they were travelling on, he ripped out the whole console:

> Sara: Well, isn't that a rather a drastic way of dealing with things?
> Steven: Look, Sara, the technology of my age may be hundreds of years behind yours and the Doctor's, but there are still some things I can handle.

Haran and colleagues (2008) note that ensemble casting can foster equality in representation because ensembles allow characters to exhibit diverse backgrounds, perspectives, experiences and relationships to science. The examples of Zoe and Jamie, Steven and Sara, and their respective Doctors, provide further evidence in support of this contention. The presence of more than one companion here disrupts the dichotomy of smart Doctor/dumb companion that has been touted as a necessary part of the *Doctor Who* formula (Chapter 3) because room is made for more than one different kind of voice.

Both 1960s Doctors precluded themselves from messianism by routinely expressing fear and doubt. Troughton's Doctor was renowned for running away, his catchphrase being "When I say run, run!" (BBC, 2009a). Hartnell's Doctor established the same in his first serial, when he bonded with Barbara, saying "Fear makes companions of us all" (*An Unearthly Child* (1963)). He lacked the typical scientist-adventurer commitment that science will see them through (Haynes, 1994), as became clear in conversation with Sara once a danger had passed:

> Doctor: Well, now, young lady, perhaps you'll have more faith in me in the future, hmm? I thought something would work out.
> Sara: *(Shocked and a little angry.)* But it was you who said we'd failed!
> Doctor: Oh, nonsense, nonsense.
> Sara: Well, it wasn't me!
> Doctor: Of course it was . . .

While this scene resembles the interactions between the Fourth Doctor and Romana, Hartnell's Doctor's lack of reflexivity was overtly problematised by his failings, since they led to genuine trouble. For example, in *The Daleks* (1963-4) the Doctor's compulsion to explore a mysterious city prompted him to deceive his companions, telling them falsely that the TARDIS required mercury, and they must go to the city to find some. The immediate result of this was that they were all captured by the Daleks and struck down with radiation sickness. The Doctor sheepishly admitted his lie, was apologetic, and was soundly criticised by the others for being so irresponsible. He was a flawed person who was subject to constant scrutiny by companions. In contrast, Baker's Doctor was a genius used to getting his own way, who bullied the competition and only failed in trivial matters.

The First Doctor was also sometimes just plain wrong. In *The Edge of Destruction* (1964), a fault with the TARDIS prompted the machine to concoct frightening phenomena to alert the crew of impending danger. The Doctor's 'logical' response to these horrors was to check all systems for function, and he was unable to find the fault. Barbara took a different, intuitive approach, interpreting the phenomena symbolically, which led to the Doctor and fellow scientist Ian mercilessly mocking her:

Barbara: Do you think something could have got into the ship?
Doctor: Oh, no. No.
Barbara: The doors were open.
Doctor: No, it's ridiculous.
Ian: *(Laughs.)* What do you mean? An animal or a man or something?
Barbara: Yes.
Doctor: Well it's not very logical is it? Hm?
Barbara: Or another intelligence.
Doctor: Well as I said, it's not very logical.
Barbara: No it isn't. But does it have to be? I mean things aren't always very logical, are they?

In the end, Barbara's non-linear approach to the problem was proved correct, and the Doctor magnanimously apologised:

Doctor: Well, as for you, young lady, well - you were absolutely right. With your instinct and intuition against my logic and you succeeded. [...] We all owe you our lives.

Here the Doctor exhibited an open-minded reflexivity worthy of Brian Wynne. He went on to tell Barbara, "As we learn about each other, so we learn about ourselves", indicating that she had broadened his already expansive horizons. Thus, non-scientists' ways of knowing were credited with as much legitimacy as science was, and the arrogance of believing otherwise was reprimanded as narrow-minded and unreflective by a brilliant scientist himself.

In all of this, publicly demonstrated fallibility on the part of scientific expert characters is a key ingredient in the recipe for demonstrating scientific reflexivity. Purely ideological versions of flawed science such as those found in 'mad scientist' stories cannot fulfil this role-modelling function because they often throw the baby out with the bath water: wholly condemning a scientific worldview rather than granting scientists an opportunity to do the credible science they are trained for within a democratically empowering social context. Weingart (2006) clearly finds scientist villains to be unhelpful role models for scientists, so perhaps what is needed for scientists to learn reflexivity is goodie scientist role models who are flawed. A fallibility that is actively negotiated in relationship with non-scientists, such as that exhibited by Zoe and the '60s Doctors, makes room for non-scientists to gain purchase in interpersonal power hierarchies via their voices of contestation but has no negative impact on the scientists. Rather, the *Doctor Who* examples suggest that such relationships can lead to the democratic co-production of truths and knowledges about science rather than an oppositional confrontation. This is an empowering model for participating in science, provided it is genuinely inclusive of the diverse range of people involved.

Messianism and the disenfranchised: the infallible scientist

If a fallible scientist can be the target of critique by companions, an infallible scientist must by definition quell any critique of themselves. As was the case with Romana, resistance to the Doctor's supremacy by non-scientist companions in the eras of Pertwee, Tom Baker, Eccleston and Tennant was generally understated and possibly

even unrecognised because these Doctors wielded their authority easily and with authorial endorsement. In this final section I demonstrate this with respect to companions Jo, Leela, Mickey and Jackie, and in more detail, Donna. I finish the chapter with a discussion of the relationship between companion Ace and McCoy's Doctor, which turned messianism on its head to effect empowerment for Ace in terms of both equality and franchise.

Companions with deficits - Jo, Leela, Mickey and Jackie

The deficit model of public understanding of science has been resoundingly critiqued by science communication scholars over the past two decades (Chapter 2), but it is alive and well in *Doctor Who*.

Two 1970s non-scientist companions, Jo and Leela, were explicitly subjects of their Doctors' PUS-style pygmalion projects. Jo was characterised as a loveable but stupid and clumsy "cloth head", including by her own admission ("I know I'm exceedingly dim"), and the Doctor took it upon himself to turn her into a scientist, primarily by preaching scientism at her. Where he credited her intelligence, he was damning with faint praise ("for a reasonably intelligent young lady you do have the most absurd ideas"). In *The Time Monster* (1972) he tried to expose her intellectual deficit and then condescended to her when she filled it herself:

Jo: You know, Doctor, you're quite the most infuriating man I've ever met. I've asked you at least a million times: what is it?

Doctor: Extraordinary. I could have sworn I'd told you. It's a time sensor.

Jo: Oh, I see.

Doctor: Do you? What's it do then?

Jo: Well it, um . . .

Doctor: Mm-hm?

Jo: It um . . . detects disturbances in a time field.

(The Doctor looks at her in amazement.)

Doctor: Well done, Jo. You're learning.

Jo was the flailing student, the Doctor the harsh science master, and there was no room for other relationships to science. When Jo espoused a belief in magic (*The Dæmons* (1971)), the Doctor was disparaging ("I'm obviously wasting my time trying to turn you into a scientist"). When Jo asked him how he can know that magic isn't real, the Doctor's sole explanation was the assertion of scientistic dogma ("everything that's happened in life must have a scientific explanation") and the rhetorical power of his own infallibility: "I just know, that's all." In this he retained power within the relationship by refusing to allow Jo access to the knowledge he held, and by flaunting the fact that he held it.

It was only in Jo's final serial *The Green Death* (1973) that she asserted her own views about science, with reference to the polluting industry of Global Chemicals (Chapter 5). Even then, though, they turned out to be adopted wholesale from Cliff Jones, a fact which the Doctor capitalised on to point out Jo's intellectual shortcomings:

Jo: I'm going to go to South Wales because they have got to be stopped.
Brigadier: Who's got to be stopped?
Jo: Well, Global Chemicals, of course. Can't you see the harm this go ahead will do?
Brigadier: No, Miss Grant, I can't. Cheap petrol and lots of it - exactly what the world needs.
Jo: No. No! Look, it's time to call a halt. It's time that the world awoke to the alarm bell of pollution instead of sliding down the slippery slopes of - of - of - whatever it is.
Doctor: A very pretty mixed metaphor.
Brigadier: Yes, I seem to recognise the style. This fellow Jones, isn't it?

If the condescending Doctor failed to fill Jo's deficit, Cliff ultimately succeeded, as Jo's mentor and husband. But through him, as with Martha, the Doctor maintained his hold. Jo told the Doctor "he reminds me of a younger you", and before they parted company, the Doctor again asserted his desire to reform her, saying, "he might even be able to turn you into a scientist."

Leela also believed in magic, being a skilled warrior from a 'primitive' tribe and having strong intuitive powers herself. From the outset, the Doctor tried to teach her that "to the rational mind nothing is inexplicable, only unexplained" and she showed occasional moments of evangelist conversion to this view (e.g. *Horror of Fang Rock* (1977), Chapter 6). The Doctor praised her adoption of his rationalist language and as with Jo enjoyed congratulating her for "learning". Initially he granted some credit to her intuitive skills, though this was often grudging, as when he witnessed her correct psychic premonition of disaster in *The Robots of Death* (1977) and responded with an understated, "please don't say I told you so". Later in her tenure he equated this talent with innate 'animal' instinct rather than skill or intelligence, tapping into stagist discourses of civilisation (Chapter 5) and demonstrating that Leela, like Jo, had an intellectual deficit.

Leela thus transformed from being a highly skilled warrior subject to the strictures of her experience (i.e. growing up in a mystical culture) to being the butt of an endless series of jokes about her intelligence. In *Underworld* (1978), when encountering a new phenomenon, the Doctor 'joked' that they would be "the first intelligent and semi-intelligent beings" to witness it. *The Invisible Enemy* (1977) saw the Doctor's body invaded by a virus that thrived on intellectual activity. The Doctor assumed this was the reason it rejected Leela as a host since she was "all instinct and intuition". Noble scientist Professor Marius agreed with this in a 'humorous' scene in which he tried to explain the science to Leela and she could not understand his immunological jargon; he concluded "perhaps it is a matter of intelligence". This is quite the opposite of the critiques of jargon found in the 1960s serials, and would seem to encourage audience members to develop an elitist mentality if they wish to maintain a self image as an intelligent person.[59] It turned out that Leela had a unique immunological factor the Doctor lacked and that *this* is why she was resistant to the virus, but this did not stop the serial exploiting Leela for its elitist humour. The Doctor further reinforced a biological determinist explanation of intelligence when miniaturised clones of the Doctor and Leela wandered around the Doctor's brain and he pointed out the feature that explains "why my brain is so much more superior to yours".

[59] While I have chosen not to engage with audience reviews as data, I cannot go past the unfortunate but revealing fan responses to Leela in *The Invisible Enemy* such as "[the Doctor] was supposed to be educating her, not vice versa" (re his use of Leela-inspired destructive violence in the serial's climax) and "the Doctor now has a mechanical pet to go with his savage" (BBC, 2009a). If this is what *Doctor Who* inspires viewers to write, it is not good.

In *The Invasion of Time* (1978), Leela's final serial, the elitist exploitation of Leela for humour became more overtly abusive, as K-9 and the Doctor ganged up on her:

Leela: Doctor, where have you been?
Doctor: Order K-9 to tell you to shut up.
Leela: *(To K-9.)* K-9, the Doctor says you are to tell me to shut up. *(Realises what she is saying.)* How dare you!
K-9: Adopt silent mode, Mistress.
Leela: K-9, you —
(K-9 extends nose laser at Leela.)
K-9: Imperative, Mistress.

Leela's tenure was not entirely without intellectual resistance from her. In *Image of the Fendahl* (1977) her earnest trust in a wise woman's traditional knowledge was proved appropriate when the wise woman provided a weapon against invading aliens. In *Horror of Fang Rock*, Leela mocked the Doctor's superior egotism when confronted with an alien who could shape shift like Time Lords:

Doctor: Elementary physiology for us is something that lesser species might master after a few thousand centuries.
Leela: Oh. Then we have nothing to worry about.
Doctor: We don't?
Leela: No! You will easily dispose of this primitive creature, Doctor. *(Mock earnest.)* You are a Time Lord.
Doctor: *(Unsure how to respond.)* Yes . . . *(Changes subject.)*

As with Jo, however, the Doctor got the last word on Leela after they had said goodbye. That word — which the Doctor said when she could not respond — was "savage".

The new series too featured companions who were treated as intellectually deficient. The Ninth Doctor quickly adopted a habit of calling Mickey "Mickey the idiot", and it took one and a half seasons for Mickey to prove his mettle to the Doctor as potential companion. Once more, there are serious political problems with this dynamic of the privileged Doctor deriding the intelligence of an unprivileged companion, in this case a black, poor, estate dwelling, self educated companion. It was also patently untrue, and

Mickey indeed played a critical heroic role several times before finally being acknowledged (*World War Three* (2005), *The Parting of the Ways* (2005), *School Reunion*, *The Age of Steel* (2006)) and even saved the world in some of them.

Similarly, the Doctor disliked Jackie from the beginning and it was suggested on many occasions that she had her priorities 'wrong'. In her final appearance, *Journey's End* (2008), when all the returning companions — Rose, Martha, Donna, Jack, Sarah and Mickey — had an opportunity to help the Doctor pilot the TARDIS, only Jackie was excluded from this by the Doctor with the words, "No, Jackie, no, no, not you. Don't touch anything. Stand back." That Jackie is still not recognised as a companion by the BBC (BBC, 2009b) and that it took so long for Mickey to be thus recognised is linked to their characterisation as inadequate people: withholding official companion status functioned to police the Doctor's elitist standards of who was deemed worthy.[60] Like Jo and Leela before them, Mickey and Jackie were a joke more than anything else. All of these characters — the blonde "cloth-head", the tribal "savage", the black "idiot" and the annoying "mother-in-law" — were seen as faulty human beings whose values were trivial and who deserved all the abuse from the Doctor that they got.

The messianic Tenth Doctor's elitism did not stop there. It reached a low point not seen before in *Doctor Who* in the narrative arc of companion Donna.

Shouting at the world, cos no one's listening - Donna

Frumpy, working class Donna Noble was portrayed as a principled and compassionate but scientifically inept character up until her last episode, *Journey's End.* At risk of death, Donna was saved via a freak accident that merged her with the Doctor. The accident resulted in three incarnations of the Doctor: the original, unchanged; a 'cloned'

[60] The companion status of both Mickey and Jackie has a checkered history. The Ninth Doctor initially treated Mickey badly, refusing to invite him onto the TARDIS because he displayed cowardice in the face of an alien threat. Mickey did not acquire companion status until Series 2, when he finally gained the Tenth Doctor's full respect. Mickey was the first black (and indeed first UK ethnic minority) canonical companion on *Doctor Who.* Mickey's companion status was dubious for several years, as evidenced in media which reported Martha as the first ethnic minority companion or first black companion (Sherwin, 2006, 2007; R. Simpson, 2006), including in comments by Freema Agyeman herself (Pool, 2007). Unlike Martha, Mickey never travelled alone with the Doctor, perhaps explaining why he was described in the media simply as a "prominent black character" (Byrne, 2006) rather than a companion, but this fact was met with some outrage by fans (e.g. neadods, 2007), since travelling alone with the Doctor has never been a requirement for companions, beginning with Barbara and Ian and continuing through to Captain Jack. Mickey has since been promoted to official companion status (BBC, 2009b). Through her appearances in Series 1 and 2, Jackie was protective of her daughter, companion Rose, and rarely grasped the bigger picture; accordingly, the Doctor did not like her very much. She is not officially considered to be a companion (BBC, 2009b), but did travel in the TARDIS in Series 2 and helped the Doctor to fight the enemy in Series 4. Combined with her regular appearances over three series, these are characteristics usually likely to grant characters companion status (TARDIS Index File, 2008). I therefore treat her as a companion.

Doctor ('Doctor 2') who was identical in appearance to the Doctor but had human physiology and empathetic insight into Donna's psyche; and the "DoctorDonna", who was Donna after she had incorporated the Doctor's intellect into her own. The three Doctors were all needed to save the universe, which was in danger of annihilation. The DoctorDonna played the primary role in that, her hybrid Doctor-logic and human "gut instinct" winning the day against insurmountable odds. Because of her, the Doctor later tells us, all across the universe "there are people living in the light, and singing songs of Donna Noble", and "for one moment - one shining moment - she was the most important woman in the whole wide universe."

The joy Donna exhibited at possessing this expertise was tangible ("The universe has been waiting for me!"), and she delighted in the future she planned, to travel with the Doctor in the TARDIS forever. Her joy was particularly contagious because she had spent her life and the series to date with zero self esteem, telling Rose in *Turn Left* (2008), "I'm nothing special, I'm a temp. I'm not even that. I'm nothing." Doctor 2 granted us insight into her self image, when he realised that her mouthy attitude was not overconfidence, but underconfidence borne of truly believing she was nothing; she was "shouting at the world, cos no one's listening." As such, Donna was surely a point of identification for many people whose self esteem had been damaged by the world. That even a ginger-haired temp from Chiswick could save the universe, that she could be the smartest, that her temp skills could combine effectively with high tech science and prove supremely useful, and that her human qualities could finally be valued, was a worthy fantasy of equality and franchise, and one that rarely appears in fiction.

But as soon as it was born, the fantasy was dashed. The tragic end to this episode saw Donna unable to cope with absorbing the Doctor's scientific super-intelligence, demonstrating how exclusive it really is. Her brain could not handle his vast intellect. As the Doctor explained to Donna's grandfather and mother: "She took my mind into her own head. But that's a Time Lord consciousness. That knowledge - it was killing her." Significantly, this did not go both ways: Doctor 2 was perfectly capable of absorbing bits of Donna with no adverse consequences, and lived happily 'ever after' with Rose as an ordinary mortal. This imbalanced treatment sends the message that Donna's problem was not biological *incompatability* as would plausibly result from hybridisation between species; the problem was her innate biological *inadequacy*. She was biologically unable to attain the Doctor's level of enlightenment. This story's

attempts to glorify the specialness of Donna in dialogue seem tokenistic when compared to this material proof of the Doctor's specialness and superiority, and Donna's ordinariness without him. To save her life, the Doctor wiped from Donna's mind all memories of himself, their adventures, and her moment of glory, and returned her to her family as she was before they met. As a final kick in the guts, Donna's grandfather — the only person who ever believed in her and valued her before she met the Doctor — insisted to the Doctor that "she was better with you". Donna then could not win: she was precluded from greatness by virtue of both her deficient biology and her flawed personality in a world without the Doctor.

In all its history and despite its many flaws, *Doctor Who* has (almost) never made claims about women's biological inferiority in the sciences (though it did make jokes to that effect about 'savage' Leela). Presumably this claim was not the intention of the show's creators when making *Journey's End*, but rather an unfortunate oversight, a product of over-zealous Doctor-worship and myth-making. However, that is no excuse. That Donna should be found wanting in her original state after all ("she was better with you"), and that she should also be denied the potential to thrive outside of that state by virtue of her biology, is an outrage for a character who is supposed to function as a point of audience identification. I shudder to think of the consequences for working class girls who admire or identify with Donna, who wanted to see her champion the universe, who enjoyed her triumph at scientific success, who saw the good of her even without the Doctor. Donna's story is not mere tragedy, as it was painted to be by the *Doctor Who* production team.[61] It is not equivalent to the sad awfulness faced by Jamie and Zoe at their departure from the series, when their memories of their adventures with the Doctor were deliberately wiped by the Time Lords as a *punishment for the Doctor*, and to which the Doctor objected. Hidden beneath Donna's 'tragedy', framed as a sad story, is sexism, classism and sickening exclusivity: it is poison to the democratisation of science.

In sum, there has been discontent in relationships between many pairs of Doctors and companions, including around science. A crucial factor that determined whether this discontent was a positive development for the democratisation of science (Barbara, Steven, Jamie) or a negative one (Jo, Leela, Mickey, Jackie, Donna) was the extent to

[61] Comments by crew members in the *Doctor Who Confidential* (BBC, 2005) episode 'End of an Era' about the making of *Journey's End* revealed their immense and genuine sorrow at Donna's demise.

which the discontent was endorsed by the program. It would be possible to side with Mickey against the Doctor's bullying and name-calling, but to do so would entail being an uncooperative viewer and choosing to disagree with the editorially endorsed hero. To protest the sexist treatment of Donna would mean resisting the realities of the Whoniverse now established in the canon. On the other hand, to take Jamie's side against the Doctor's excesses in *The Evil of the Daleks* would only entail cooperating with the text, which is a far easier path for a viewer to take (Fiske, 1984; Suleiman, 1976). In order for this kind of discontent to be empowering, the issues must be actively contested so that viewers can make up their own minds who they agree with and identify with. As in real life, a one-sided argument in which only one right answer is allowed is no less than bullying, and is not an ideal path to the democratisation of science.

Rewriting the myth - Ace

Concluding on a positive note is the traditional way to end a *Doctor Who* serial. In terms of the democratisation of science, the relationship between McCoy's Doctor and Ace was a positive one. Ace was a companion for just over two short seasons and nine serials (1987-89), all but three serials of McCoy's era.

A self-taught explosives expert, Ace was a 20th century Earth teenager who was carried to another planet in a time storm while trying to extract nitroglycerine from gelignite. In many ways Ace represented an empowering meld between ideals of franchise and equality, since she participated in science through her explosives interventions and simultaneously wished to prise authority from those who possessed it. In her first serial she revealed her fraught relationship with parents ("I ain't got no Mum and Dad, I don't want no Mum and Dad, it's just me, get it?") and teachers back on Earth ("they couldn't understand how blowing up the art room was a creative act"). When Mel hassled her about not washing her clothes for a couple of months, Ace retorted, "You're just like the teachers used to be at school. *(Mocking.)* 'How do you expect to pass your chemistry A-level if you can't even store the equipment properly?'" Ace was an angry, rebellious young woman, and a sympathetic one who chose her own relationship to science. Her skill with explosives was both useful to the Doctor and supported by him, as when he said "my young friend's something of an expert" (*Battlefield* (1989)). But she also told

the science like it is, admitting that she made her own recipe of "nitro-9" in old deodorant cans. In *The Curse of Fenric* (1989) she demonstrated her understanding of a logic puzzle that the brilliant 1940s mathematician Dr Judson was working on and Judson called her "a mathematical specialist", but Ace still called the puzzle a "flip-flop thingy". Ace did not possess the language of science but she knew what she liked. She related to science as it was relevant to her life and was granted space to define its terms and parameters in her own way. She explicitly did not have a deficit despite rejecting conventional science education. In these ways, Ace was the very embodiment of PAS ideals.

In the McCoy era, the *Doctor Who* production team led by script editor Andrew Cartmel wished to inject more mystery into the Doctor's characterisation (BBC, 2009a). It was the first era to cultivate the mythology of the Doctor in the absence of an overt rhetoric of him as scientist, setting the scene for the new series. In this sense McCoy's Doctor fit the messianic mould. There was a strong sense that he possessed knowledge, skills and influence well beyond that which were apparent on screen. He was thus largely omniscient and effectively omnipotent in a similar way to the Doctors of Pertwee, Tom Baker, Eccleston and Tennant. However, he differed from them in one critical respect: he was often not the program's main character, leaving that to Ace, particularly in their last three serials: *Ghost Light*, *The Curse of Fenric* and *Survival* (all 1989). In all three, Ace underwent a traumatic narrative journey that touched deep emotions, personal issues and past experiences for her: she was the low mimetic or ironic hero of these tales (Frye, [1957] 1969), while the Doctor carried on his mythic battles with essentialised evil almost in the background. All three had settings or characters of profound importance to Ace: a mansion she burnt down (*Ghost Light*), her grandmother as a young woman (*Fenric*), her home suburb of Perivale and teenage friends (*Survival*). Hence, quite often, the universe did not revolve around the Doctor, the plot resolutions did not hinge on him, and he did not embody the core moral message of the story. Messianism as such was not the main point of his serials.

For this reason, his suggestions were sometimes rejected or his decisions called to account without adverse consequences for the challengers. The most incisive critiques of the possibility of a 'cult of Doctor' came from *The Curse of Fenric*. The Doctor's introverted mysteriousness was mildly tutted by Ace when he ignored something she said ("only don't bother listening to me, cos I'm only a mere mortal"). Later she

accidentally caused disaster because the Doctor failed to share critical information with her. Finally, she confronted his 'Time Lord's burden' attitude for being elitist:

Ace: You know what's going on, don't you?
Doctor: Yes.
Ace: You always know. You just can't be bothered to tell anyone. It's like it's some kind of a game and only you know the rules. You knew all about that inscription being a computer program, but you didn't tell me. You know all about that old bottle, and you're not telling me. Am I so stupid?
Doctor: No, that's not it.
Ace: Why, then? I want to know.
Doctor: Evil. Evil since the dawn of time.
Ace: What do you mean?
Doctor: Will you stop asking me these questions.
Ace: Tell me!!

This confrontation forced the Doctor to dump his elitism, share his knowledge and involve Ace in solutions to the problems.

Perhaps most importantly, the very idea that faith in the Doctor is a good thing was also critiqued in *The Curse of Fenric*. The monsters in the story were the vampire-like haemovores who could be rendered harmless by faith in some idea — be it religious, political or otherwise — if a person's belief was strong enough. Ace's unfailing faith in the Doctor prevented the chief haemovore from destroying the real villain, the evil force Fenric, who planned to turn the Earth into a chemical wasteland. The Doctor then destroyed Ace's faith in him, in order to save the world. Doing this was unpleasant: he triggered all Ace's insecurities by telling Fenric, in front of her, that he "knew she carried the evil inside her" and "wouldn't waste my time on her unless I had to use her somehow", that she was "a social misfit", "an emotional cripple" and "couldn't even pass her chemistry exams", and that Fenric should "kill her". Ace was utterly devastated as a result, but it worked. The Doctor then profusely apologied, explained, and convinced her that none of what he said was true. Their relationship recovered, but importantly, the Doctor characterised the faith trap as the eponymous "curse of Fenric". Unerring faith in experts was thus soundly problematised.

If Ace is a role model for viewers, we learn from her that handing over our agency to messiahs, heroes, experts may have its comforts and rewards, but it cannot solve all problems, and in fact can be downright dangerous. The way forward for the democratisation of science then is solidarity between scientists and everyone else, that we may solve our problems as equals together.

CHAPTER 8 CONCLUSIONS
AUDIENCE EMPOWERMENT THROUGH FICTION

The role of a conclusion is to summarise what has been done and what is yet to be done. There is much in *Doctor Who* that appeared in my notes but has not materialised in the thesis due to space constraints. For example, a topic that deserves attention but which I ultimately omitted is a review of the knowledge systems alternative to science (magic, spirituality, psychic powers) that are granted truth authority in some serials. This is usually in the guise of sophisticated science, but not always. The fuzzy boundary between magic and speculative but potentially plausible science has been discussed by others: Arthur C. Clarke wrote "Any sufficiently advanced technology is indistinguishable from magic" (Clarke, 2006, p. xii). I have touched on (and problematised) this in deconstructing Time Lord magic. Nonetheless Morgaine's use of sorcery (*Battlefield* (1989)) or Professor Clegg's psychic abilities (*The Time Monster* (1972)) are part of the overall portrait of science painted by *Doctor Who*. For some viewers and scholars, the (limited) legitimacy granted to 'white witch' Olive Hawthorne's magical powers in *The Dæmons* (1971) may be the most critical moment in the history of *Doctor Who* for the democratisation of science, particularly since it comes in the scientistic decade of the 1970s, and excluding it necessarily means leaving the portrait incomplete. This is, however, inevitable for a program that has been running as long as *Doctor Who*, and I leave it to future workers to analyse the significance of such moments for science communication.

Regardless of what I have omitted, as the first work on this specific topic I have identified some important ideological threads that run through the show and which are core for characterising its meanings. Rather than simply reviewing the representations of science in *Doctor Who*, I have attempted in each analytical chapter to make my conclusions more broadly applicable by speaking to aspects of the science communication literature and related texts. I have agreed with Hourihan's (1997) analysis of the hero construct. Building on the work of Toumey (1992, 1996) and Weingart (2006), I have added nuance to our understanding of the meaning of mad scientists. I have added new dimensions to feminist scholarship on the relationship between gender, femininity, reflexivity and scientific credibility. I have drawn parallels

between Ruppersberg's (1990) alien messiahs and the technocratic expertise critiqued by the likes of Jasanoff (2003) and Wynne (2003). These aspects of the thesis speak broadly to the relationship between science-based fiction in general and the democratisation of science, beyond the particular case study of *Doctor Who*.

Since this is a work in science communication, and therefore carries a responsibility to recognise the importance of public engagement with these ideas, the most glaring question facing the thesis is whether its findings hold up with real audiences. Until my ideas are tested on live human beings, they can only be hypotheses. Is the new *Doctor Who* popular because David Tennant's Doctor is a messianic figure? Or do people like it for its special effects, its attractive actors, its sprinkling of celebrity guest stars? Do audiences hear that Magnus Greel in *The Talons of Weng-Chiang* is excluded from the community of scientists by the Doctor's normative empiricist rhetoric, or do they simply see cultural referents invoking the idea of the mad scientist, and thence equate Greel with science? Does it matter to audiences who care about the dearth of television role models for young black women that Martha loses her scientific trappings by the end of her first season, or is it enough that she remains a positive, brave, strong character? If *Terminus* was a boring serial that few people watched and to which fewer still paid attention, was its radical message of democratisation entirely lost on viewers until I analysed it for this thesis? Or was it popular and engaging but widely interpreted to be about something else entirely?

Illustrating the point, my own feelings about *Doctor Who* have changed since doing this research and I have seen elements I had previously overlooked as viewer and fan. I would never have chosen *The Edge of Destruction* as an exemplar of good television since it is a bizarre, nonsensical serial with a laughably unconvincing resolution and the most luddite special effects imaginable. The TARDIS is in danger because a spring — yes, a spring — gets stuck on the ship's 'fast return' switch, and the 'dramatic' resolution involves correcting this. The switch itself is labelled on the TARDIS console in felt tip pen. A few years ago my sister and I included this serial in an internet quiz we wrote entitled 'Doctor Who: the forgotten and the torturous' because of the serious shortcomings in its non-ironic entertainment value.[62] Nonetheless, my mental impressions of the serial are now evangelistically positive because of what it offers to the democratisation of science. In the same quiz we also mocked *The Krotons*, but now

[62] See http://www.funtrivia.com/quizdetails.cfm?quiz=239551.

it is one of my favourite serials. Along similar lines, scientistic Pertwee was my favourite Doctor before this research, but now he is my least favourite aside from lonely god Tennant, who ranks bottom. This has nothing to do with these actors' charisma or talent, but results from the ideologies their Doctors represent. My favourite Doctor is now the reflexive Troughton, but when confessing that to my *Doctor Who* fan father, he thought I was joking. I have become a firm and genuine believer in my own *Doctor Who*-democratisation rhetoric. It would not be appropriate, however, to argue that other people should necessarily adopt that same belief system, since audience responses to television (as to anything) are myriad and will vary immensely with context. In addition, television speaks to so many aspects of our lives that its impacts can be contradictory. For example I cannot help crying at *Last of the Time Lords* or *Journey's End*, even while I rage against Martha's subordinate worship of the Doctor and the show's unforgiveably elitist treatment of Donna. They are emotionally moving and hence highly engaging serials even if they are politically reprehensible. I have gained much from this research but it would be a shame to lose completely the innocent pleasure of enjoying my favourite television program regardless of its political ideologies. After all, I have been watching it for three decades but have not (I hope) become a sexist, elitist champion of scientism. It would be possible to hypothesise that the 'bad' aspects of the program have been subconsciously corrupting people's relationships with science for half a century, delightfully packaged as entertainment like poison in a spoonful of honey, but unless that is backed up empirically, it remains scholarly conjecture.

It remains to bring the thesis together and offer a unified statement of what *Doctor Who* specifically and science-based fiction in general can contribute to the democratisation of science. In both cases the contribution is mixed. I agree with Hourihan's (1997) structuralist argument that the constraints placed on fiction by literary conventions and the cultural expectations they reproduce severely limit the ability of fiction to serve a democratising function. The hero device and the alien messiah archetype cannot do other than obstruct democratic participation in science governance: it is their *raison d'être* to be uniquely special, to be saviours of the disenfranchised and to promote particular (Western Enlightenment) kinds of ideology. However, both Hourihan and Haran *et al.* (2008) document storytelling conventions that cut against this, such as telling stories in the low mimetic or ironic modes, and capitalising on the opportunities for character complexity made available through ensemble casts. I have shown that both

of these strategies have been effective tools for democratising science in *Doctor Who*. Ensemble casts for the TARDIS crew made room simultaneously for dissent about science and credible female scientist characters in the Hartnell, Troughton and Davison eras. The foregrounding of Ace in the McCoy era made room for her to find her own pathway to empowerment irrespective of his backgrounded omnipotence. Where the Doctor or any other central, male, expert scientist character ceases to be uniquely special and a saviour and becomes subject to the same material conditions as the other characters as in *Terminus*, there is potential for representations of science to be democratically empowering rather than oppressive.

Fiction's contribution to the democratisation of science is rendered complex in part because it can send contradictory messages. Serials that feature scientist villains who cause suffering or destruction ought to be powerful outlets for public concerns about science, and it seems likely that the authorial intention in about half of *Doctor Who*'s scientist villain serials is exactly that: lay protest about science. These serials can be considered to be a radical public framing of the role science should and should not play in society, equivalent to 'second wave' reflexivity in Collins and Evans' (2002) terminology. This democratising function is undermined though, not only by those scientist villain serials in which the message is twisted into supporting science or attributing blame elsewhere, but by the central character of the Doctor when he is functioning in hero/messiah mode, corresponding to a 'first wave' model of technocratic expertise in which society is saved by an expert. The treatment of other characters adds another dimension of complexity to the governance model on offer, confusing the message further depending on how much power they have, how much voice they have, and whether they are permitted by the ideological closure to disagree with the Doctor. It is little wonder that people respond to television fiction in contradictory ways, when the models of democratisation it promotes may unintentionally be diametrically opposed.

Of course, similar critiques may be levelled at any science communication intended to be democratically empowering, even with the best of intentions. The power dynamics that infest our very being affect our ability to claim authority when we normally have none and to surrender it when people demand that we use our 'expert' training to better society. A science communicator agitating on behalf of publics to achieve public participation in framing debates about science is in some ways a walking contradiction.

Any representationalism is inherently limited in its ability to effect democracy. In science communication these struggles are so young that we are still working out how to manage them, even if we are relatively clear about our ideals and even clearer about what we know we do not want. Democratisation is, by definition, not a logic puzzle to be solved with right and wrong answers. Even if it were, once solved the answers would change with contexts of time, space, culture and contingencies. To paraphrase the Enlightenment liberal John Philpot Curran, the price of democracy is eternal vigilance, because it is a process for all of us to participate in, not an object to be discovered and pinned in a display box.

What then of Malcolm Wicks' injunction to use new series *Doctor Who* to engage students in the science classroom? If a science teacher's greatest need is to attract the attention of a majority of students in order that they may learn some science fact, this injunction is probably a good one. It does not, however, take into account the potential for adverse impacts on a minority subset of students or even a marginalised majority, given its implicit endorsement of inequality and elitism. Girls and women in the classroom, particularly if they are working class and/or black, might be subtly encouraged to believe that they are not good enough for science by the representations of Martha and Donna. On the other hand they may be inspired by characters such as Dee Dee Blasco, River Song or Captain Magambo. Students may find a whole new respect for older female scientists because of the positive role model provided by Professor Docherty.

The cautions of the British Association of Science Teachers that teachers must be careful to differentiate science from fantasy if using *Doctor Who* are pertinent from both a PUS and PAS perspective. The conflation of the two in the new series might potentially lead students to adopt 'irrational' mystical beliefs that are anathema to PUS or to unrealistically cornucopian expectations of science that are anathema to PAS. There is also the risk that oppressive Enlightenment discourses such as scientism and imperialism will come to be associated with science without question. Indeed, if there is anything undemocratic in *Doctor Who* at all, showing it to students could reinforce undemocratic mental models of science, which is not good whether they continue studying science or decide to give it up. Having said that, the likelihood of this happening and the extent to which students will unquestioningly adopt the ideologies contained in a fictional text are utterly unknown. Not only do audiences respond

differently to the same text, but scholars are undecided about the rhetorical power of fiction as discussed in Chapter 3, and there is almost no empirical research into this question. It is also true that many students will already have seen *Doctor Who* (since the point of using it in the classroom is to capitalise on its popularity) so they will already be exposed to these ideas. Indeed, that the ideas are so widespread in popular discourse about science is the heart of the problem for the democratisation of science. The particular risk of using *Doctor Who* in the classroom is that its undemocratic ideologies would be implicitly endorsed by the teacher, and thus reinforced as 'truth'.

On the other hand, to put a more positive spin on things, *Doctor Who* could be an excellent talking point for debating these very issues. For many scholars this is the core purpose of science fiction. Fiction allows us to engage with controversial ideas in a way that has less material impact on our lives than if we were to play out the controversies in real life. What better way to discuss impediments to women's access to science work than to show how Martha is gradually stripped of her credibility, or to debate whether Donna should have been allowed to keep her Time Lord consciousness? How better to introduce questions of science ethics than to watch the inhuman experiments in *New Earth*, the Faustian ambitions in *The Lazarus Experiment* and *Rise of the Cybermen*, or the reckless curiosity in *The Impossible Planet*? Think of the playground arguments that could be started or (preferably) resolved with a class discussion of the scientistic solution to religious tribalism in *The Doctor's Daughter*. The latter would require thoughtfulness, since it might be difficult for students to disagree publically with the Doctor and to argue for the legitimacy of religious beliefs in the face of his secularism, but it is possible, and religious-positive serials such as *Gridlock* may temper hostilities if viewed alongside. More obviously, any number of *Doctor Who* serials might be used to open a conversation about the boundaries of science and magic. Democratisation starts with talking through the issues and framing them in accordance with our own values. Instead of assuming that *Doctor Who* will brainwash students, it is more liberating to think of *Doctor Who* as an opportunity, a tool, to open the way for students and indeed teachers to articulate our thoughts and feelings about what science is and the role we would like to see it play in our societies, cultures and individual lives.

In this analysis I have found much that is problematic about *Doctor Who*. Its dominant ideology is one based on Western Enlightenment values that reproduce masculinist individualism, imperialism, elitism and scientism. To quote out of context the 1983

serial *Enlightenment*, “Enlightenment was the choice.” Yet this is what makes it interesting. It is even what makes it useful, because it brings to the surface ideologies that permeate modern Western society, rendering them vulnerable to critique. Alongside those ideologies bubble empowering, democratic values and contestation. The good, the bad and the ambivalent mix together in a rich discursive soup 45 years in the making.

In *Genesis of the Daleks*, the Doctor is tortured by an ethical dilemma when given the opportunity to destroy the Daleks as an infant species. He reasons against it with the argument that many things will be better because of the Daleks, that future worlds will become allies through mutual fear of the Daleks. He reasons also that if he were to genocidally wipe out the Daleks he would become just as evil as them. It is an appropriate hesitation when faced with the opportunity to wield one’s power so absolutely. Similarly, as a science communication scholar it is unreasonable to wholly condemn *Doctor Who* for its problematic commitments given its attempts at improving, its successes, and the opportunities it offers to engage with these issues. Whatever its politics, *Doctor Who* contributes richly to the culture of science, indeed to the culture of humanity. Like the Doctor, I must concede to humanist optimism and know that out of its objectionable ideologies must come something good.

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Doctor[1]	Season[2]	Serial[3]	Year[4]	Serial title[5]	Companions[6]	Production team[7]
1 William Hartnell	1	1	63	An Unearthly Child	Susan, Barbara, Ian	Lambert/Whitaker
		2	63-4	The Daleks	Susan, Barbara, Ian	Lambert/Whitaker
		3	64	The Edge of Destruction	Susan, Barbara, Ian	Lambert/Whitaker
		4	64	Marco Polo	Susan, Barbara, Ian	Lambert/Whitaker
		5	64	The Keys of Marinus	Susan, Barbara, Ian	Lambert/Whitaker
		6	64	The Aztecs	Susan, Barbara, Ian	Lambert/Whitaker
		7	64	The Sensorites	Susan, Barbara, Ian	Lambert/Whitaker
		8	64	The Reign of Terror	Susan, Barbara, Ian	Lambert/Whitaker
	2	9	64	Planet of Giants	Susan, Barbara, Ian	Lambert/Whitaker
		10	64	The Dalek Invasion of Earth	Susan, Barbara, Ian	Lambert/Whitaker
		11	65	The Rescue	Barbara, Ian, Vicki	Lambert/Spooner
		12	65	The Romans	Barbara, Ian, Vicki	Lambert/Spooner
		13	65	The Web Planet	Barbara, Ian, Vicki	Lambert/Spooner
		14	65	The Crusade	Barbara, Ian, Vicki	Lambert/Spooner
		15	65	The Space Museum	Barbara, Ian, Vicki	Lambert/Spooner
		16	65	The Chase	Barbara, Ian, Vicki, Steven	Lambert/Spooner
		17	65	The Time Meddler	Vicki, Steven	Lambert/Tosh
	3	18	65	Galaxy 4	Vicki, Steven	Lambert/Tosh
		19	65	Mission to the Unknown	Vicki, Steven	Lambert/Tosh
		20	65	The Myth Makers	Vicki, Steven, Katarina	Wiles/Tosh
		21	65-6	The Daleks' Master Plan	Steven, Katarina, (Sara)	Wiles/Whitaker
		22	66	The Massacre	Steven, Dodo	Wiles/Tosh
		23	66	The Ark	Steven, Dodo	Wiles/Davis
		24	66	The Celestial Toymaker	Steven, Dodo	Lloyd/Davis
		25	66	The Gunfighters	Steven, Dodo	Lloyd/Davis
		26	66	The Savages	Steven, Dodo	Lloyd/Davis
		27	66	The War Machines	Dodo, Polly, Ben	Lloyd/Davis
	4	28	66	The Smugglers	Polly, Ben	Lloyd/Davis
		29	66	The Tenth Planet	Polly, Ben	Lloyd/Davis
2 Patrick Troughton		30	66	The Power of the Daleks	Polly, Ben	Lloyd/Davis
		31	66-7	The Highlanders	Polly, Ben, Jamie	Lloyd/Davis
		32	67	The Underwater Menace	Polly, Ben, Jamie	Lloyd/Davis
		33	67	The Moonbase	Polly, Ben, Jamie	Lloyd/Davis
		34	67	The Macra Terror	Polly, Ben, Jamie	Lloyd/Davis
		35	67	The Faceless Ones	Polly, Ben, Jamie	Lloyd/Davis
		36	67	The Evil of the Daleks	Jamie, Victoria	Lloyd/Davis

Doctor	Season	Serial	Year	Serial title	Companions	Production team
	5	37	67	The Tomb of the Cybermen	Jamie, Victoria	Lloyd/Pemberton
		38	67	The Abominable Snowmen	Jamie, Victoria	Lloyd/Bryant
		39	67	The Ice Warriors	Jamie, Victoria	Lloyd/Bryant
		40	67-8	The Enemy of the World	Jamie, Victoria	Lloyd/Bryant
		41	68	The Web of Fear	Jamie, Victoria	Bryant/Sherwin
		42	68	Fury from the Deep	Jamie, Victoria	Bryant/Sherwin
		43	68	The Wheel in Space	Jamie, Zoe	Bryant/Sherwin
	6	44	68	The Dominators	Jamie, Zoe	Bryant/Sherwin
		45	68	The Mind Robber	Jamie, Zoe	Bryant/Sherwin
		46	68	The Invasion	Jamie, Zoe	Bryant/Dicks
		47	68-9	The Krotons	Jamie, Zoe	Bryant/Dicks
		48	69	The Seeds of Death	Jamie, Zoe	Bryant/Dicks
		49	69	The Space Pirates	Jamie, Zoe	Bryant/Sherwin
		50	69	The War Games	Jamie, Zoe	Sherwin/Dicks
3 Jon Pertwee	7	51	70	Spearhead from Space	Liz, UNIT	Sherwin/Dicks
		52	70	The Silurians	Liz, UNIT	Letts/Dicks
		53	70	The Ambassadors of Death	Liz, UNIT	Letts/Dicks
		54	70	Inferno	Liz, UNIT	Letts/Dicks
	8	55	71	Terror of the Autons	Jo, UNIT	Letts/Dicks
		56	71	The Mind of Evil	Jo, UNIT	Letts/Dicks
		57	71	The Claws of Axos	Jo, UNIT	Letts/Dicks
		58	71	Colony in Space	Jo	Letts/Dicks
		59	71	The Daemons	Jo, UNIT	Letts/Dicks
	9	60	72	Day of the Daleks	Jo, UNIT	Letts/Dicks
		61	72	The Curse of Peladon	Jo	Letts/Dicks
		62	72	The Sea Devils	Jo, UNIT	Letts/Dicks
		63	72	The Mutants	Jo	Letts/Dicks
		64	72	The Time Monster	Jo, UNIT	Letts/Dicks
1, 2, 3	10	65	72-3	The Three Doctors	Jo, UNIT	Letts/Dicks
		66	73	Carnival of Monsters	Jo	Letts/Dicks
		67	73	Frontier in Space	Jo	Letts/Dicks
		68	73	Planet of the Daleks	Jo	Letts/Dicks
		69	73	The Green Death	Jo, UNIT	Letts/Dicks

Doctor	Season	Serial	Year	Serial title	Companions	Production team
	11	70	73-4	The Time Warrior	Sarah	Letts/Dicks
		71	74	Invasion of the Dinosaurs	Sarah, UNIT	Letts/Dicks
		72	74	Death to the Daleks	Sarah	Letts/Dicks
		73	74	The Monster of Peladon	Sarah	Letts/Dicks
		74	74	Planet of the Spiders	Sarah, UNIT	Letts/Dicks
4 Tom Baker	12	75	74-5	Robot	Sarah, Harry, UNIT	Letts/Holmes
		76	75	The Ark in Space	Sarah, Harry	Hinchcliffe/Holmes
		77	75	The Sontaran Experiment	Sarah, Harry	Hinchcliffe/Holmes
		78	75	Genesis of the Daleks	Sarah, Harry	Hinchcliffe/Holmes
		79	75	Revenge of the Cybermen	Sarah, Harry	Hinchcliffe/Holmes
	13	80	75	Terror of the Zygons	Sarah, Harry, UNIT	Hinchcliffe/Holmes
		81	75	Planet of Evil	Sarah	Hinchcliffe/Holmes
		82	75	Pyramids of Mars	Sarah	Hinchcliffe/Holmes
		83	75	The Android Invasion	Sarah	Hinchcliffe/Holmes
		84	76	The Brain of Morbius	Sarah	Hinchcliffe/Holmes
		85	76	The Seeds of Doom	Sarah	Hinchcliffe/Holmes
	14	86	76	The Masque of Mandragora	Sarah	Hinchcliffe/Holmes
		87	76	The Hand of Fear	Sarah	Hinchcliffe/Holmes
		88	76	The Deadly Assassin	-	Hinchcliffe/Holmes
		89	77	The Face of Evil	Leela	Hinchcliffe/Holmes
		90	77	The Robots of Death	Leela	Hinchcliffe/Holmes
		91	77	The Talons of Weng-Chiang	Leela	Hinchcliffe/Holmes
	15	92	77	Horror of Fang Rock	Leela	Williams/Holmes
		93	77	The Invisible Enemy	Leela, K9	Williams/Holmes
		94	77	Image of the Fendahl	Leela, K9	Williams/Holmes
		95	77	The Sun Makers	Leela, K9	Williams/Holmes
		96	78	Underworld	Leela, K9	Williams/Read
		97	78	The Invasion of Time	Leela, K9	Williams/Read
	16	98	78	The Ribos Operation	Romana I, K9	Williams/Read
		99	78	The Pirate Planet	Romana I, K9	Williams/Read
		100	78	The Stones of Blood	Romana I, K9	Williams/Read
		101	78	The Androids of Tara	Romana I, K9	Williams/Read
		102	78-9	The Power of Kroll	Romana I, K9	Williams/Read
		103	79	The Armageddon Factor	Romana I, K9	Williams/Read

Doctor	Season	Serial	Year	Serial title	Companions	Production team
	17	104	79	Destiny of the Daleks	Romana II, K9	Williams/Adams
		105	79	City of Death	Romana II, K9	Williams/Adams
		106	79	The Creature from the Pit	Romana II, K9	Williams/Adams
		107	79	Nightmare of Eden	Romana II, K9	Williams/Adams
		108	79-80	The Horns of Nimon	Romana II, K9	Williams/Adams
		109	(80)	Shada	Romana II, K9	Williams/Adams
	18	110	80	The Leisure Hive	Romana II, K9	Nathan-Turner/Bidmead
		111	80	Meglos	Romana II, K9	Nathan-Turner/Bidmead
		112	80	Full Circle	Romana II, Adric, K9	Nathan-Turner/Bidmead
		113	80	State of Decay	Romana II, Adric, K9	Nathan-Turner/Bidmead
		114	81	Warriors' Gate	Romana II, Adric, K9	Nathan-Turner/Bidmead
		115	81	The Keeper of Traken	Adric, Nyssa	Nathan-Turner/Bidmead
		116	81	Logopolis	Adric, Nyssa, Tegan	Nathan-Turner/Bidmead
5 Peter Davison	19	117	82	Castrovalva	Adric, Nyssa, Tegan	Nathan-Turner/Saward
		118	82	Four to Doomsday	Adric, Nyssa, Tegan	Nathan-Turner/Root
		119	82	Kinda	Adric, Nyssa, Tegan	Nathan-Turner/Saward
		120	82	The Visitation	Adric, Nyssa, Tegan	Nathan-Turner/Root
		121	82	Black Orchid	Adric, Nyssa, Tegan	Nathan-Turner/Saward
		122	82	Earthshock	Adric, Nyssa, Tegan	Nathan-Turner/Root
		123	82	Time-Flight	Nyssa, Tegan	Nathan-Turner/Saward
	20	124	83	Arc of Infinity	Nyssa, Tegan	Nathan-Turner/Saward
		125	83	Snakedance	Nyssa, Tegan	Nathan-Turner/Saward
		126	83	Mawdryn Undead	Nyssa, Tegan, Turlough, Brig	Nathan-Turner/Saward
		127	83	Terminus	Nyssa, Tegan, Turlough	Nathan-Turner/Saward
		128	83	Enlightenment	Tegan, Turlough	Nathan-Turner/Saward
		129	83	The King's Demons	Tegan, Turlough, Kamelion	Nathan-Turner/Saward
1, 2, 3, 4, 5	Special	130	83	The Five Doctors	Tegan, Turlough, Susan, Brigadier, Sarah, (Romana)	Nathan-Turner/Saward
	21	131	84	Warriors of the Deep	Tegan, Turlough	Nathan-Turner/Saward
		132	84	The Awakening	Tegan, Turlough	Nathan-Turner/Saward
		133	84	Frontios	Tegan, Turlough	Nathan-Turner/Saward
		134	84	Resurrection of the Daleks	Tegan, Turlough	Nathan-Turner/Saward
		135	84	Planet of Fire	Turlough, Kamelion, Peri	Nathan-Turner/Saward
		136	84	The Caves of Androzani	Peri	Nathan-Turner/Saward
6 Colin Baker		137	84	The Twin Dilemma	Peri	Nathan-Turner/Saward

Doctor	Season	Serial	Year	Serial title	Companions	Production team
	22	138	85	Attack of the Cybermen	Peri	Nathan-Turner/Saward
		139	85	Vengeance on Varos	Peri	Nathan-Turner/Saward
		140	85	The Mark of the Rani	Peri	Nathan-Turner/Saward
2, 6		141	85	The Two Doctors	Peri, Jamie	Nathan-Turner/Saward
		142	85	Timelash	Peri	Nathan-Turner/Saward
		143	85	Revelation of the Daleks	Peri	Nathan-Turner/Saward
	23	144	86	The Mysterious Planet	Peri	Nathan-Turner/Saward
		145	86	Mindwarp	Peri	Nathan-Turner/Saward
		146	86	Terror of the Vervoids	Mel	Nathan-Turner/Nathan-Turner
		147	86	The Ultimate Foe	Mel	Nathan-Turner/Saward
7 Sylvester McCoy	24	148	87	Time and the Rani	Mel	Nathan-Turner/Cartmel
		149	87	Paradise Towers	Mel	Nathan-Turner/Cartmel
		150	87	Delta and the Bannermen	Mel	Nathan-Turner/Cartmel
		151	87	Dragonfire	Mel, Ace	Nathan-Turner/Cartmel
	25	152	88	Remembrance of the Daleks	Ace	Nathan-Turner/Cartmel
		153	88	The Happiness Patrol	Ace	Nathan-Turner/Cartmel
		154	88	Silver Nemesis	Ace	Nathan-Turner/Cartmel
		155	88	The Greatest Show in the Galaxy	Ace	Nathan-Turner/Cartmel
	26	156	89	Battlefield	Ace, Brigadier	Nathan-Turner/Cartmel
		157	89	Ghost Light	Ace	Nathan-Turner/Cartmel
		158	89	The Curse of Fenric	Ace	Nathan-Turner/Cartmel
		159	89	Survival	Ace	Nathan-Turner/Cartmel
8 Paul McGann	Movie	160	96	(The TV Movie called *Doctor Who*)		Prod: Peter V Ware

collectively known as *Trial of a Time Lord*

Doctor	Series	Serial	Year	Episode title	Companions	Production team
9 Christopher Eccleston	Series 1	161	05	Rose	Rose	Collinson/Rowlands
		162	05	The End of the World	Rose	Collinson/Rowlands
		163	05	The Unquiet Dead	Rose	Collinson/Raynor
		164	05	Aliens of London	Rose	Collinson/Rowlands
		164	05	World War III	Rose	Collinson/Rowlands
		165	05	Dalek	Rose, Adam	Collinson/Raynor
		166	05	The Long Game	Rose, Adam	Collinson/Rowlands
		167	05	Father's Day	Rose	Collinson/Rowlands
		168	05	The Empty Child	Rose, Jack	Collinson/Raynor
		168	05	The Doctor Dances	Rose, Jack	Collinson/Raynor

Doctor	Series	Serial	Year	Episode title	Companions	Production team
		169	05	Boom Town	Rose, Jack	Collinson/Rowlands
		170	05	Bad Wolf	Rose, Jack	Collinson/Raynor
		170	05	The Parting of the Ways	Rose, Jack	Collinson/Raynor
10 David Tennant	Xmas 1	171	05	The Christmas Invasion	Rose	Collinson/Raynor
	Series 2	172	06	New Earth	Rose	Collinson/Winstone
		173	06	Tooth and Claw	Rose	Collinson/Winstone
		174	06	School Reunion	Rose, Mickey, Sarah, K9	Collinson/Raynor
		175	06	The Girl in the Fireplace	Rose, Mickey	Collinson/Raynor
		176	06	Rise of the Cybermen	Rose, Mickey	Collinson/Raynor
		176	06	The Age of Steel	Rose, Mickey	Collinson/Raynor
		177	06	The Idiot's Lantern	Rose	Collinson/Winstone
		178	06	The Impossible Planet	Rose	Collinson/Winstone
		178	06	The Satan Pit	Rose	Collinson/Winstone
		179	06	Love & Monsters	Rose	Liggat/Winstone
		180	06	Fear Her	Rose	Collinson/Winstone
		181	06	Army of Ghosts	Rose, Mickey, Jackie	Liggat/Raynor
		181	06	Doomsday	Rose, Mickey, Jackie	Liggat/Raynor
	Xmas 2	182	06	The Runaway Bride	Donna	Collinson/Winstone
	Series 3	183	07	Smith and Jones	Martha	Collinson/Winstone
		184	07	The Shakespeare Code	Martha	Collinson/Winstone
		185	07	Gridlock	Martha	Collinson/Winstone
		186	07	Daleks in Manhattan	Martha	Collinson/Winstone
		186	07	Evolution of the Daleks	Martha	Collinson/Winstone
		187	07	The Lazarus Experiment	Martha	Collinson/Winstone
		188	07	42	Martha	Collinson/Winstone
		189	07	Human Nature	Martha	Liggat/Alford
		189	07	The Family of Blood	Martha	Liggat/Alford
		190	07	Blink	Martha	Collinson/Raynor
		191	07	Utopia	Martha, Jack	Collinson/Winstone
		191	07	The Sound of Drums	Martha, Jack	Collinson/Winstone
		191	07	Last of the Time Lords	Martha, Jack	Collinson/Winstone
	Xmas 3	192	07	Voyage of the Damned	-	Collinson/Minchin

Doctor	Series	Serial	Year	Episode title	Companions	Production team
	Series 4	193	08	Partners in Crime	Donna	Collinson/Alford
		194	08	The Fires of Pompeii	Donna	Collinson/Minchin
		195	08	Planet of the Ood	Donna	Liggat/Alford
		196	08	The Sontaran Stratagem	Donna, Martha	Liggat/Smith
		196	08	The Poison Sky	Donna, Martha	Liggat/Smith
		197	08	The Doctor's Daughter	Donna, Martha	Collinson/Alford
		198	08	The Unicorn and the Wasp	Donna	Liggat/Alford
		199	08	Silence in the Library	Donna	Collinson/Raynor
		199	08	Forest of the Dead	Donna	Collinson/Raynor
		200	08	Midnight	Donna	Collinson/Raynor
		201	08	Turn Left	Donna, Rose	Liggat/Minchin
		202	08	The Stolen Earth	Donna, Rose, Martha, Jack, Mickey, Jackie, Sarah, K9	Collinson/Alford
		202	08	Journey's End		Collinson/Alford
	Xmas 4	203	08	The Next Doctor	-	Liggat/Alford

[1] Where multiple Doctors appear in one story, they are listed by numeral only for space reasons. Full names mark the Doctor 'eras' proper. Regeneration transition appearances and flashbacks are not listed. For *The Five Doctors*, the deceased William Hartnell was replaced by actor Richard Hurndall.

[2] While most seasons/series are distinct units, the 20th anniversary special story *The Five Doctors* (1983) and the new series' Christmas specials *The Christmas Invasion*, *The Runaway Bride*, *Voyage of the Damned* and *The Next Doctor* are generally considered standalone canonical episodes. Other shorts and specials are excluded because of questionable canonicity.

[3] In the absence of an official source on this, serial numbers follow those listed in Wikipedia (Wikipedia, 2008). Originally serials were given letter combinations (A-ZZZ), but these do not cover the entire series so are less useful than the numeral system I borrow here.

[4] The year here refers to the year of original transmission on the BBC (Source: BBC, 2009a). *Shada* was never completed due to industrial action and so was not transmitted during its original 1979-80 season.

[5] Where ambiguous in the classic series I follow the serial names listed at the BBC website (BBC, 2009a), aside from *Doctor Who and the Silurians* which was supposed to be simply *The Silurians* but was altered by mistake in post production (Pixley, 2001). 'Lost stories' (with all or some episodes missing) are highlighted in grey.

[6] Returning companions are listed where they function as companions rather than serving other functions; Romana is bracketed for *The Five Doctors* because she appeared only in previously unbroadcast snippets from *Shada*. Mickey and Jackie are listed from the first time each travelled in the TARDIS. Classic series companions are listed for the full period of their tenure whether or not they appeared in the story (e.g. no Doctor or companion was in *Mission to the Unknown*, Nyssa was absent for most of *Kinda*, K-9 often made only tokenistic appearances, etc), with the exceptions of UNIT and Kamelion. UNIT is listed only in its 1970s incarnation when it played a major part in the plot as an organisation led by the Brigadier, and when the Brigadier, Benton and/or Yates fulfilled roles as the Doctor's companions; I have not distinguished between these characters except when the Brigadier reappears alone later. Kamelion only appeared in its first and last stories and was basically ignored in between.

[7] The production teams listed are Producer/Script Editor. In the classic series, this combination of production crew members most strongly determined the style of the program (Hulke and Dicks, 1972). In the new series, a different production arrangement meant that executive producer and head writer Russell T Davies has generally been considered to be the single most influential person for the four series he was involved with (Charles, 2008), but this is assumed and he is not listed. Full names of the producers and script editors in order of appearance: Verity Lambert, David Whitaker, Dennis Spooner, Donald Tosh, John Wiles, Gerry Davis, Innes Lloyd, Victor Pemberton, Peter Bryant, Derrick Sherwin, Terrance Dicks, Barry Letts, Robert Holmes, Philip Hinchcliffe, Graham Williams, Anthony Read, Douglas Adams, John Nathan-Turner, Christopher H Bidmead, Eric Saward, Antony Root, Andrew Cartmel, Phil Collinson, Elwen Rowlands, Helen Raynor, Simon Winstone, Susie Liggat, Lindsey Alford, Brian Minchin, Nikki Smith (Sources: BBC, 2009a, BBC, 2009b; IMDB, 2008).

APPENDIX B1 A CHRONOLOGICAL LIST OF *DOCTOR WHO* SERIALS, DIRECTORS AND WRITERS[1]

Season	Serial title	Directors	Writers	Notes[2]
1	An Unearthly Child	Waris Hussein	Anthony Coburn & CE Webber	Webber was not credited
	The Daleks	Christopher Barry & Richard Martin	Terry Nation	
	The Edge of Destruction	Richard Martin & Frank Cox	David Whitaker	
	Marco Polo	Waris Hussein & John Crockett	John Lucarotti	
	The Keys of Marinus	John Gorrie	Terry Nation	
	The Aztecs	John Crockett	John Lucarotti	
	The Sensorites	Mervyn Pinfield & Frank Cox	Peter R Newman	
	The Reign of Terror	Henric Hirsch & John Gorrie	Dennis Spooner	
2	Planet of Giants	Mervyn Pinfield & Douglas Camfield	Louis Marks	
	The Dalek Invasion of Earth	Richard Martin	Terry Nation	
	The Rescue	Christopher Barry	David Whitaker	
	The Romans	Christopher Barry	Dennis Spooner	
	The Web Planet	Richard Martin	Bill Strutton	
	The Crusade	Douglas Camfield	David Whitaker	
	The Space Museum	Mervyn Pinfield	Glyn Jones	
	The Chase	Richard Martin	Terry Nation	
	The Time Meddler	Douglas Camfield	Dennis Spooner	
3	Galaxy 4	Derek Martinus & Mervyn Pinfield	William Emms	Pinfield was not credited
	Mission to the Unknown	Derek Martinus	Terry Nation	
	The Myth Makers	Michael Leeston-Smith	Donald Cotton	
	The Daleks' Master Plan	Douglas Camfield	Terry Nation & Dennis Spooner	from a story by Terry Nation
	The Massacre	Paddy Russell	John Lucarotti & Donald Tosh	
	The Ark	Michael Imison	Paul Erickson & Lesley Scott	
	The Celestial Toymaker	Bill Sellars	Brian Hayles & Donald Tosh	Tosh was not credited
	The Gunfighters	Rex Tucker	Donald Cotton	
	The Savages	Christopher Barry	Ian Stuart Black	
	The War Machines	Michael Ferguson	Ian Stuart Black	based on an idea by Kit Pedler
4	The Smugglers	Julia Smith	Brian Hayles	
	The Tenth Planet	Derek Martinus	Kit Pedler & Gerry Davis	
	The Power of the Daleks	Christopher Barry	David Whitaker & Dennis Spooner	Spooner was not credited
	The Highlanders	Hugh David	Gerry Davis & Elwyn Jones	Jones did not contribute despite credit
	The Underwater Menace	Julia Smith	Geoffrey Orme	
	The Moonbase	Morris Barry	Kit Pedler	
	The Macra Terror	John Davies	Ian Stuart Black	
	The Faceless Ones	Gerry Mill	David Ellis & Malcolm Hulke	
	The Evil of the Daleks	Derek Martinus & Timothy Combe	David Whitaker	

Season	Serial title	Directors	Writers	Notes
5	The Tomb of the Cybermen	Morris Barry	Kit Pedler & Gerry Davis	
	The Abominable Snowmen	Gerald Blake	Mervyn Haisman & Henry Lincoln	
	The Ice Warriors	Derek Martinus	Brian Hayles	
	The Enemy of the World	Barry Letts	David Whitaker	
	The Web of Fear	Douglas Camfield	Mervyn Haisman & Henry Lincoln	
	Fury from the Deep	Hugh David	Victor Pemberton	
	The Wheel in Space	Tristan de Vere Cole	David Whitaker	from a story by Kit Pedler
6	The Dominators	Morris Barry	Haisman, Lincoln & Sherwin	writer pseudonym Norman Ashby
	The Mind Robber	David Maloney	Peter Ling & Derrick Sherwin	Sherwin was not credited
	The Invasion	Douglas Camfield	Derrick Sherwin	from a story by Kit Pedler
	The Krotons	David Maloney	Robert Holmes	
	The Seeds of Death	Michael Ferguson	Brian Hayles & Terrance Dicks	Dicks was not credited
	The Space Pirates	Michael Hart	Robert Holmes	
	The War Games	David Maloney	Terrance Dicks & Malcolm Hulke	
7	Spearhead from Space	Derek Martinus	Robert Holmes	
	The Silurians	Timothy Combe	Malcolm Hulke	
	The Ambassadors of Death	Michael Ferguson	Whitaker, Hulke, Dicks & Trevor Ray	Hulke, Dicks & Ray were not credited
	Inferno	Douglas Camfield & Barry Letts	Don Houghton	Letts was not credited
8	Terror of the Autons	Barry Letts	Robert Holmes	Letts was not credited
	The Mind of Evil	Timothy Combe	Don Houghton	
	The Claws of Axos	Michael Ferguson	Bob Baker & Dave Martin	
	Colony in Space	Michael E Briant	Malcolm Hulke	
	The Daemons	Christopher Barry	Robert Sloman & Barry Letts	writer pseudonym Guy Leopold
9	Day of the Daleks	Paul Bernard	Louis Marks	
	The Curse of Peladon	Lennie Mayne	Brian Hayles	
	The Sea Devils	Michael E Briant	Malcolm Hulke	
	The Mutants	Christopher Barry	Bob Baker & Dave Martin	
	The Time Monster	Paul Bernard	Robert Sloman & Barry Letts	Letts was not credited
10	The Three Doctors	Lennie Mayne	Bob Baker & Dave Martin	
	Carnival of Monsters	Barry Letts	Robert Holmes	
	Frontier in Space	Paul Bernard & David Maloney	Malcolm Hulke	Maloney was not credited
	Planet of the Daleks	David Maloney	Terry Nation	
	The Green Death	Michael E Briant	Robert Sloman & Barry Letts	Letts was not credited

Season	Serial title	Directors	Writers	Notes
11	The Time Warrior	Alan Bromly	Robert Holmes	
	Invasion of the Dinosaurs	Paddy Russell	Malcolm Hulke	
	Death to the Daleks	Michael E Briant	Terry Nation	
	The Monster of Peladon	Lennie Mayne	Brian Hayles	
	Planet of the Spiders	Barry Letts	Robert Sloman & Barry Letts	Letts was not credited as writer
12	Robot	Christopher Barry	Terrance Dicks	
	The Ark in Space	Rodney Bennett	Robert Holmes	
	The Sontaran Experiment	Rodney Bennett	Bob Baker & Dave Martin	
	Genesis of the Daleks	David Maloney	Terry Nation	
	Revenge of the Cybermen	Michael E Briant	Gerry Davis	
13	Terror of the Zygons	Douglas Camfield	Robert Banks Stewart	
	Planet of Evil	David Maloney	Louis Marks	
	Pyramids of Mars	Paddy Russell	Robert Holmes & Lewis Griefer	writer pseudonym Stephen Harris
	The Android Invasion	Barry Letts	Terry Nation	
	The Brain of Morbius	Christopher Barry	Terrance Dicks & Robert Holmes	writer pseudonym Robin Bland
	The Seeds of Doom	Douglas Camfield	Robert Banks Stewart	
14	The Masque of Mandragora	Rodney Bennett	Louis Marks	
	The Hand of Fear	Lennie Mayne	Bob Baker & Dave Martin	
	The Deadly Assassin	David Maloney	Robert Holmes	
	The Face of Evil	Pennant Roberts	Chris Boucher	
	The Robots of Death	Michael E Briant	Chris Boucher	
	The Talons of Weng-Chiang	David Maloney	Robert Holmes	from an idea by Robert Banks Stewart
15	Horror of Fang Rock	Paddy Russell	Terrance Dicks	
	The invisible Enemy	Derrick Goodwin	Bob Baker & Dave Martin	
	Image of the Fendahl	George Spenton-Foster	Chris Boucher	
	The Sun Makers	Pennant Roberts	Robert Holmes	
	Underworld	Norman Stewart	Bob Baker & Dave Martin	
	The Invasion of Time	Gerald Blake	Graham Williams & Anthony Read	writer pseudonym David Agnew
16	The Ribos Operation	George Spenton-Foster	Robert Holmes	
	The Pirate Planet	Pennant Roberts	Douglas Adams	
	The Stones of Blood	Darrol Blake	David Fisher	
	The Androids of Tara	Michael Hayes	David Fisher	
	The Power of Kroll	Norman Stewart	Robert Holmes	
	The Armageddon Factor	Michael Hayes	Bob Baker & Dave Martin	

Season	Serial title	Directors	Writers	Notes
17	Destiny of the Daleks	Ken Grieve	Terry Nation	
	City of Death	Michael Hayes	Graham Williams & Douglas Adams	writer pseudonym David Agnew
	The Creature from the Pit	Christopher Barry	David Fisher	
	Nightmare of Eden	Alan Bromly	Bob Baker	
	The Horns of Nimon	Kenny McBain	Anthony Read	
	Shada	Pennant Roberts	Douglas Adams	
18	The Leisure Hive	Lovett Bickford	David Fisher	
	Meglos	Terence Dudley	John Flanagan & Andrew McCulloch	
	Full Circle	Peter Grimwade	Andrew Smith	
	State of Decay	Peter Moffatt	Terrance Dicks	
	Warriors' Gate	Paul Joyce	Steve Gallagher	
	The Keeper of Traken	John Black	Johnny Byrne	
	Logopolis	Peter Grimwade	Christopher H Bidmead	
19	Castrovalva	Fiona Cumming	Christopher H Bidmead	
	Four to Doomsday	John Black	Terence Dudley	
	Kinda	Peter Grimwade	Christopher Bailey	
	The Visitation	Peter Moffatt	Eric Saward	
	Black Orchid	Ron Jones	Terence Dudley	
	Earthshock	Peter Grimwade	Eric Saward	
	Time-Flight	Ron Jones	Peter Grimwade	
20	Arc of Infinity	Ron Jones	Johnny Byrne	
	Snakedance	Fiona Cumming	Christopher Bailey	
	Mawdryn Undead	Peter Moffatt	Peter Grimwade	
	Terminus	Mary Ridge	Steve Gallagher	
	Enlightenment	Fiona Cumming	Barbara Clegg	
	The King's Demons	Tony Virgo	Terence Dudley	
Special	The Five Doctors	Peter Moffatt	Terrance Dicks	
21	Warriors of the Deep	Pennant Roberts	Johnny Byrne	
	The Awakening	Michael Owen Morris	Eric Pringle	
	Frontios	Ron Jones	Christopher H Bidmead	
	Resurrection of the Daleks	Matthew Robinson	Eric Saward	
	Planet of Fire	Fiona Cumming	Peter Grimwade	
	The Caves of Androzani	Graeme Harper	Robert Holmes	
	The Twin Dilemma	Peter Moffatt	Anthony Steven	

Season	Serial title	Directors	Writers	Notes
22	Attack of the Cybermen	Matthew Robinson	Paula Woolsey & Eric Saward	writer pseudonym Paula Moore
	Vengeance on Varos	Ron Jones	Philip Martin	
	The Mark of the Rani	Sarah Hellings	Pip & Jane Baker	
	The Two Doctors	Peter Moffatt	Robert Holmes	
	Timelash	Pennant Roberts	Glen McCoy	
	Revelation of the Daleks	Graeme Harper	Eric Saward	
23	The Mysterious Planet	Nicholas Mallett	Robert Holmes	
	Mindwarp	Ron Jones	Philip Martin	
	Terror of the Vervoids	Chris Clough	Pip & Jane Baker	
	The Ultimate Foe	Chris Clough	Robert Holmes & Pip & Jane Baker	
24	Time and the Rani	Andrew Morgan	Pip & Jane Baker	
	Paradise Towers	Nicholas Mallett	Stephen Wyatt	
	Delta and the Bannermen	Chris Clough	Malcolm Kohll	
	Dragonfire	Chris Clough	Ian Briggs	
25	Remembrance of the Daleks	Andrew Morgan	Ben Aaronovitch	
	The Happiness Patrol	Chris Clough	Graeme Curry	
	Silver Nemesis	Chris Clough	Kevin Clarke	
	The Greatest Show in the Galaxy	Alan Wareing	Stephen Wyatt	
26	Battlefield	Michael Kerrigan	Ben Aaronovitch	
	Ghost Light	Alan Wareing	Marc Platt	
	The Curse of Fenric	Nicholas Mallett	Ian Briggs	
	Survival	Alan Wareing	Rona Munro	

Series	Episode title[3]	Directors	Writers
Series 1	Rose	Keith Boak	Russell T Davies
	The End of the World	Euros Lyn	Russell T Davies
	The Unquiet Dead	Euros Lyn	Mark Gatiss
	Aliens of London/World War Three	Keith Boak	Russell T Davies
	Dalek	Joe Ahearne	Robert Shearman
	The Long Game	Brian Grant	Russell T Davies
	Father's Day	Joe Ahearne	Paul Cornell
	The Empty Child/The Doctor Dances	James Hawes	Steven Moffat
	Boom Town	Joe Ahearne	Russell T Davies
	Bad Wolf/The Parting of the Ways	Joe Ahearne	Russell T Davies
Xmas 1	The Christmas Invasion	James Hawes	Russell T Davies

Series	Episode title	Directors	Writers
Series 2	New Earth	James Hawes	Russell T Davies
	Tooth and Claw	Euros Lyn	Russell T Davies
	School Reunion	James Hawes	Toby Whithouse
	The Girl in the Fireplace	Euros Lyn	Steven Moffat
	Rise of the Cybermen/The Age of Steel	Graeme Harper	Tom MacRae
	The Idiot's Lantern	Euros Lyn	Mark Gatiss
	The Impossible Planet/The Satan Pit	James Strong	Matt Jones
	Love & Monsters	Dan Zeff	Russell T Davies
	Fear Her	Euros Lyn	Matthew Graham
	Army of Ghosts/Doomsday	Graeme Harper	Russell T Davies
Xmas 2	The Runaway Bride	Euros Lyn	Russell T Davies
Series 3	Smith and Jones	James Strong & Charles Palmer	Russell T Davies
	The Shakespeare Code	Charles Palmer	Gareth Roberts
	Gridlock	Richard Clark	Russell T Davies
	Daleks in Manhattan/Evolution of the Daleks	James Strong	Helen Raynor
	The Lazarus Experiment	Richard Clark	Stephen Greenhorn
	42	Graeme Harper	Chris Chibnall
	Human Nature/The Family of Blood	Charles Palmer	Paul Cornell
	Blink	Hettie Macdonald	Steven Moffat
	Utopia	Graeme Harper	Russell T Davies
	The Sound of Drums	Colin Teague	Russell T Davies
	Last of the Time Lords	Colin Teague & Graeme Harper	Russell T Davies
Xmas 3	Voyage of the Damned	James Strong	Russell T Davies
Series 4	Partners in Crime	James Strong	Russell T Davies
	The Fires of Pompeii	Colin Teague	James Moran
	Planet of the Ood	Graeme Harper	Keith Temple
	The Sontaran Stratagem/The Poison Sky	Douglas Mackinnon	Helen Raynor
	The Doctor's Daughter	Alice Troughton	Stephen Greenhorn
	The Unicorn and the Wasp	Graeme Harper	Gareth Roberts
	Silence in the Library	Euros Lyn	Steven Moffat
	Forest of the Dead	Graeme Harper	Steven Moffat
	Midnight	Alice Troughton	Russell T Davies
	Turn Left	Graeme Harper	Russell T Davies
	The Stolen Earth/Journey's End	Graeme Harper	Russell T Davies
Xmas 4	The Next Doctor	Andy Goddard	Russell T Davies

APPENDIX B2 *DOCTOR WHO* SERIALS SORTED BY WRITER[4]

Writers	Serial title	Serial
Andrew Smith	Full Circle	112
Anthony Coburn & CE Webber	An Unearthly Child	1
Anthony Read	The Horns of Nimon	108
Anthony Read & Graham Williams	The Invasion of Time	97
Anthony Steven	The Twin Dilemma	137
Barbara Clegg	Enlightenment	128
Ben Aaronovitch	Remembrance of the Daleks	152
Ben Aaronovitch	Battlefield	156
Bill Strutton	The Web Planet	13
Bob Baker	Nightmare of Eden	107
Bob Baker & Dave Martin	The Claws of Axos	57
Bob Baker & Dave Martin	The Mutants	63
Bob Baker & Dave Martin	The Three Doctors	65
Bob Baker & Dave Martin	The Sontaran Experiment	77
Bob Baker & Dave Martin	The Hand of Fear	87
Bob Baker & Dave Martin	The Invisible Enemy	93
Bob Baker & Dave Martin	Underworld	96
Bob Baker & Dave Martin	The Armageddon Factor	103
Brian Hayles	The Smugglers	28
Brian Hayles	The Ice Warriors	39
Brian Hayles	The Curse of Peladon	61
Brian Hayles	The Monster of Peladon	73
Brian Hayles & Donald Tosh	The Celestial Toymaker	24
Brian Hayles & Terrance Dicks	The Seeds of Death	48
Chris Boucher	The Face of Evil	89
Chris Boucher	The Robots of Death	90
Chris Boucher	Image of the Fendahl	94
Chris Chibnall	42	188
Christopher Bailey	Kinda	119
Christopher Bailey	Snakedance	125
Christopher H Bidmead	Logopolis	116
Christopher H Bidmead	Castrovalva	117
Christopher H Bidmead	Frontios	133
David Ellis & Malcolm Hulke	The Faceless Ones	35
David Fisher	The Stones of Blood	100
David Fisher	The Androids of Tara	101
David Fisher	The Creature from the Pit	106
David Fisher	The Leisure Hive	110
David Whitaker	The Edge of Destruction	3

Writers	Serial title	Serial
David Whitaker	The Rescue	11
David Whitaker	The Crusade	14
David Whitaker	The Evil of the Daleks	36
David Whitaker	The Enemy of the World	40
David Whitaker	The Wheel in Space	43
David Whitaker & Dennis Spooner	The Power of the Daleks	30
David Whitaker, Malcolm Hulke, Terrance Dicks & Trevor Ray	The Ambassadors of Death	53
Dennis Spooner	The Reign of Terror	8
Dennis Spooner	The Romans	12
Dennis Spooner	The Time Meddler	17
Dennis Spooner & David Whitaker	The Power of the Daleks	30
Dennis Spooner & Terry Nation	The Daleks' Master Plan	21
Derrick Sherwin	The Invasion	46
Derrick Sherwin, Mervyn Haisman & Henry Lincoln	The Dominators	44
Derrick Sherwin & Peter Ling	The Mind Robber	45
Don Houghton	Inferno	54
Don Houghton	The Mind of Evil	56
Donald Cotton	The Myth Makers	20
Donald Cotton	The Gunfighters	25
Donald Tosh & Brian Hayles	The Celestial Toymaker	24
Donald Tosh & John Lucarotti	The Massacre	22
Douglas Adams	The Pirate Planet	99
Douglas Adams	Shada	109
Douglas Adams & Graham Williams	City of Death	105
Elwyn Jones & Gerry Davis	The Highlanders	31
Eric Pringle	The Awakening	132
Eric Saward	The Visitation	120
Eric Saward	Earthshock	122
Eric Saward	Resurrection of the Daleks	134
Eric Saward	Revelation of the Daleks	143
Eric Saward & Paula Woolsey	Attack of the Cybermen	138
Gareth Roberts	The Shakespeare Code	184
Gareth Roberts	The Unicorn and the Wasp	198
Geoffrey Orme	The Underwater Menace	32
Gerry Davis	Revenge of the Cybermen	79
Gerry Davis & Elwyn Jones	The Highlanders	31
Gerry Davis & Kit Pedler	The Tenth Planet	29
Gerry Davis & Kit Pedler	The Tomb of the Cybermen	37
Glen McCoy	Timelash	142
Glyn Jones	The Space Museum	15
Graeme Curry	The Happiness Patrol	153

Writers	Serial title	Serial
Graham Williams & Anthony Read	The Invasion of Time	97
Graham Williams & Douglas Adams	City of Death	105
Helen Raynor	Daleks in Manhattan/Evolution of the Daleks	186
Helen Raynor	The Sontaran Stratagem/The Poison Sky	196
Ian Briggs	Dragonfire	151
Ian Briggs	The Curse of Fenric	158
Ian Stuart Black	The Savages	26
Ian Stuart Black	The War Machines	27
Ian Stuart Black	The Macra Terror	34
James Moran	The Fires of Pompeii	194
John Flanagan & Andrew McCulloch	Meglos	111
John Lucarotti	Marco Polo	4
John Lucarotti	The Aztecs	6
John Lucarotti & Donald Tosh	The Massacre	22
Johnny Byrne	The Keeper of Traken	115
Johnny Byrne	Arc of Infinity	124
Johnny Byrne	Warriors of the Deep	131
Keith Temple	Planet of the Ood	195
Kevin Clarke	Silver Nemesis	154
Kit Pedler	The Moonbase	33
Kit Pedler & Gerry Davis	The Tenth Planet	29
Kit Pedler & Gerry Davis	The Tomb of the Cybermen	37
Louis Marks	Planet of Giants	9
Louis Marks	Day of the Daleks	60
Louis Marks	Planet of Evil	81
Louis Marks	The Masque of Mandragora	86
Malcolm Hulke	The Silurians	52
Malcolm Hulke	Colony in Space	58
Malcolm Hulke	The Sea Devils	62
Malcolm Hulke	Frontier in Space	67
Malcolm Hulke	Invasion of the Dinosaurs	71
Malcolm Hulke & David Ellis	The Faceless Ones	35
Malcolm Hulke, David Whitaker, Terrance Dicks & Trevor Ray	The Ambassadors of Death	53
Malcolm Hulke & Terrance Dicks	The War Games	50
Malcolm Kohll	Delta and the Bannermen	150
Marc Platt	Ghost Light	157
Mark Gatiss	The Unquiet Dead	163
Mark Gatiss	The Idiot's Lantern	177
Matt Jones	The Impossible Planet/The Satan Pit	178
Matthew Graham	Fear Her	180
Mervyn Haisman & Henry Lincoln	The Abominable Snowmen	38

Writers	Serial title	Serial
Mervyn Haisman & Henry Lincoln	The Web of Fear	41
Mervyn Haisman, Henry Lincoln & Derrick Sherwin	The Dominators	44
Paul Cornell	Father's Day	167
Paul Cornell	Human Nature/The Family of Blood	189
Paul Erickson & Lesley Scott	The Ark	23
Paula Woolsey & Eric Saward	Attack of the Cybermen	138
Peter Grimwade	Time-Flight	123
Peter Grimwade	Mawdryn Undead	126
Peter Grimwade	Planet of Fire	135
Peter Ling & Derrick Sherwin	The Mind Robber	45
Peter R Newman	The Sensorites	7
Philip Martin	Vengeance on Varos	139
Philip Martin	Mindwarp	145
Pip & Jane Baker	The Mark of the Rani	140
Pip & Jane Baker	Terror of the Vervoids	146
Pip & Jane Baker	Time and the Rani	148
Pip & Jane Baker & Robert Holmes	The Ultimate Foe	147
Robert Banks Stewart	Terror of the Zygons	80
Robert Banks Stewart	The Seeds of Doom	85
Robert Holmes	The Krotons	47
Robert Holmes	The Space Pirates	49
Robert Holmes	Spearhead from Space	51
Robert Holmes	Terror of the Autons	55
Robert Holmes	Carnival of Monsters	66
Robert Holmes	The Time Warrior	70
Robert Holmes	The Ark in Space	76
Robert Holmes	The Deadly Assassin	88
Robert Holmes	The Talons of Weng-Chiang	91
Robert Holmes	The Sun Makers	95
Robert Holmes	The Ribos Operation	98
Robert Holmes	The Power of Kroll	102
Robert Holmes	The Caves of Androzani	136
Robert Holmes	The Two Doctors	141
Robert Holmes	The Mysterious Planet	144
Robert Holmes & Lewis Griefer	Pyramids of Mars	82
Robert Holmes & Pip & Jane Baker	The Ultimate Foe	147
Robert Holmes & Terrance Dicks	The Brain of Morbius	84
Robert Shearman	Dalek	165
Robert Sloman & Barry Letts	The Daemons	59
Robert Sloman & Barry Letts	The Time Monster	64
Robert Sloman & Barry Letts	The Green Death	69

Writers	Serial title	Serial
Robert Sloman & Barry Letts	Planet of the Spiders	74
Rona Munro	Survival	159
Russell T Davies	Rose	161
Russell T Davies	The End of the World	162
Russell T Davies	Aliens of London/World War Three	164
Russell T Davies	The Long Game	166
Russell T Davies	Boom Town	169
Russell T Davies	Bad Wolf/The Parting of the Ways	170
Russell T Davies	The Christmas Invasion	171
Russell T Davies	New Earth	172
Russell T Davies	Tooth and Claw	173
Russell T Davies	Love & Monsters	179
Russell T Davies	Army of Ghosts/Doomsday	181
Russell T Davies	The Runaway Bride	182
Russell T Davies	Smith and Jones	183
Russell T Davies	Gridlock	185
Russell T Davies	Utopia/The Sound of Drums/Last of the Time Lords	191
Russell T Davies	Voyage of the Damned	192
Russell T Davies	Partners in Crime	193
Russell T Davies	Midnight	200
Russell T Davies	Turn Left	201
Russell T Davies	The Stolen Earth/Journey's End	202
Russell T Davies	The Next Doctor	203
Stephen Greenhorn	The Lazarus Experiment	187
Stephen Greenhorn	The Doctor's Daughter	197
Stephen Wyatt	Paradise Towers	149
Stephen Wyatt	The Greatest Show in the Galaxy	155
Steve Gallagher	Warriors' Gate	114
Steve Gallagher	Terminus	127
Steven Moffat	The Empty Child/The Doctor Dances	168
Steven Moffat	The Girl in the Fireplace	175
Steven Moffat	Blink	190
Steven Moffat	Forest of the Dead/Silence in the Library	199
Terence Dudley	Four to Doomsday	118
Terence Dudley	Black Orchid	121
Terence Dudley	The King's Demons	129
Terrance Dicks	Robot	75
Terrance Dicks	Horror of Fang Rock	92
Terrance Dicks	State of Decay	113
Terrance Dicks	The Five Doctors	130
Terrance Dicks & Brian Hayles	The Seeds of Death	48

Writers	Serial title	Serial
Terrance Dicks, David Whitaker, Malcolm Hulke & Trevor Ray	The Ambassadors of Death	53
Terrance Dicks & Malcolm Hulke	The War Games	50
Terrance Dicks & Robert Holmes	The Brain of Morbius	84
Terry Nation	The Daleks	2
Terry Nation	The Keys of Marinus	5
Terry Nation	The Dalek Invasion of Earth	10
Terry Nation	The Chase	16
Terry Nation	Mission to the Unknown	19
Terry Nation	Planet of the Daleks	68
Terry Nation	Death to the Daleks	72
Terry Nation	Genesis of the Daleks	78
Terry Nation	The Android Invasion	83
Terry Nation	Destiny of the Daleks	104
Terry Nation & Dennis Spooner	The Daleks' Master Plan	21
Toby Whithouse	School Reunion	174
Tom MacRae	Rise of the Cybermen/The Age of Steel	176
Victor Pemberton	Fury from the Deep	42
William Emms	Galaxy 4	18

APPENDIX B3 *DOCTOR WHO* SERIALS SORTED BY DIRECTOR[5]

Directors	Serial title	Serial
Alan Bromly	The Time Warrior	70
Alan Bromly	Nightmare of Eden	107
Alan Wareing	The Greatest Show in the Galaxy	155
Alan Wareing	Ghost Light	157
Alan Wareing	Survival	159
Alice Troughton	The Doctor's Daughter	197
Alice Troughton	Midnight	200
Andrew Morgan	Time and the Rani	148
Andrew Morgan	Remembrance of the Daleks	152
Andy Goddard	The Next Doctor	203
Barry Letts	The Enemy of the World	40
Barry Letts	Terror of the Autons	55
Barry Letts	Carnival of Monsters	66
Barry Letts	Planet of the Spiders	74
Barry Letts	The Android Invasion	83
Barry Letts & Douglas Camfield	Infemo	54
Bill Sellars	The Celestial Toymaker	24
Brian Grant	The Long Game	166
Charles Palmer	The Shakespeare Code	184
Charles Palmer	Human Nature/The Family of Blood	189
Charles Palmer & James Strong	Smith and Jones	183
Chris Clough	Terror of the Vervoids	146
Chris Clough	The Ultimate Foe	147
Chris Clough	Delta and the Bannermen	150
Chris Clough	Dragonfire	151
Chris Clough	The Happiness Patrol	153
Chris Clough	Silver Nemesis	154
Christopher Barry	The Rescue	11
Christopher Barry	The Romans	12
Christopher Barry	The Savages	26
Christopher Barry	The Power of the Daleks	30
Christopher Barry	The Daemons	59
Christopher Barry	The Mutants	63
Christopher Barry	Robot	75
Christopher Barry	The Brain of Morbius	84
Christopher Barry	The Creature from the Pit	106
Christopher Barry & Richard Martin	The Daleks	2
Colin Teague	The Sound of Drums	191
Colin Teague	The Fires of Pompeii	194

Directors	Serial title	Serial
Colin Teague & Graeme Harper	Last of the Time Lords	191
Dan Zeff	Love & Monsters	179
Darrol Blake	The Stones of Blood	100
David Maloney	The Mind Robber	45
David Maloney	The Krotons	47
David Maloney	The War Games	50
David Maloney	Planet of the Daleks	68
David Maloney	Genesis of the Daleks	78
David Maloney	Planet of Evil	81
David Maloney	The Deadly Assassin	88
David Maloney	The Talons of Weng-Chiang	91
David Maloney & Paul Bernard	Frontier in Space	67
Derek Martinus	Mission to the Unknown	19
Derek Martinus	The Tenth Planet	29
Derek Martinus	The Ice Warriors	39
Derek Martinus	Spearhead from Space	51
Derek Martinus & Mervyn Pinfield	Galaxy 4	18
Derek Martinus & Timothy Combe	The Evil of the Daleks	36
Derrick Goodwin	The invisible Enemy	93
Douglas Camfield	The Crusade	14
Douglas Camfield	The Time Meddler	17
Douglas Camfield	The Daleks' Master Plan	21
Douglas Camfield	The Web of Fear	41
Douglas Camfield	The Invasion	46
Douglas Camfield	Terror of the Zygons	80
Douglas Camfield	The Seeds of Doom	85
Douglas Camfield & Barry Letts	Inferno	54
Douglas Camfield & Mervyn Pinfield	Planet of Giants	9
Douglas Mackinnon	The Sontaran Stratagem/The Poison Sky	196
Euros Lyn	The End of the World	162
Euros Lyn	The Unquiet Dead	163
Euros Lyn	Tooth and Claw	173
Euros Lyn	The Girl in the Fireplace	175
Euros Lyn	The Idiot's Lantern	177
Euros Lyn	Fear Her	180
Euros Lyn	The Runaway Bride	182
Euros Lyn	Silence in the Library	199
Frank Cox & Mervyn Pinfield	The Sensorites	7
Frank Cox & Richard Martin	The Edge of Destruction	3
Fiona Cumming	Castrovalva	117

Directors	Serial title	Serial
Fiona Cumming	Snakedance	125
Fiona Cumming	Enlightenment	128
Fiona Cumming	Planet of Fire	135
George Spenton-Foster	Image of the Fendahl	94
George Spenton-Foster	The Ribos Operation	98
Gerald Blake	The Abominable Snowmen	38
Gerald Blake	The Invasion of Time	97
Gerry Mill	The Faceless Ones	35
Graeme Harper	The Caves of Androzani	136
Graeme Harper	Revelation of the Daleks	143
Graeme Harper	Rise of the Cybermen/The Age of Steel	176
Graeme Harper	Army of Ghosts/Doomsday	181
Graeme Harper	42	188
Graeme Harper	Utopia	191
Graeme Harper	Planet of the Ood	195
Graeme Harper	The Unicorn and the Wasp	198
Graeme Harper	Forest of the Dead	199
Graeme Harper	Turn Left	201
Graeme Harper	The Stolen Earth/Journey's End	202
Graeme Harper & Colin Teague	Last of the Time Lords	191
Henric Hirsch & John Gorrie	The Reign of Terror	8
Hettie Macdonald	Blink	190
Hugh David	The Highlanders	31
Hugh David	Fury from the Deep	42
James Hawes	The Empty Child/The Doctor Dances	168
James Hawes	The Christmas Invasion	171
James Hawes	New Earth	172
James Hawes	School Reunion	174
James Strong	The Impossible Planet/The Satan Pit	178
James Strong	Daleks in Manhattan/Evolution of the Daleks	186
James Strong	Voyage of the Damned	192
James Strong	Partners in Crime	193
James Strong & Charles Palmer	Smith and Jones	183
Joe Ahearne	Dalek	165
Joe Ahearne	Father's Day	167
Joe Ahearne	Boom Town	169
Joe Ahearne	Bad Wolf/The Parting of the Ways	170
John Black	The Keeper of Traken	115
John Black	Four to Doomsday	118
John Crockett	The Aztecs	6

Directors	Serial title	Serial
John Crockett & Waris Hussein	Marco Polo	4
John Davies	The Macra Terror	34
John Gorrie	The Keys of Marinus	5
John Gorrie & Henric Hirsch	The Reign of Terror	8
Julia Smith	The Smugglers	28
Julia Smith	The Underwater Menace	32
Keith Boak	Rose	161
Keith Boak	Aliens of London/World War Three	164
Ken Grieve	Destiny of the Daleks	104
Kenny McBain	The Horns of Nimon	108
Lennie Mayne	The Curse of Peladon	61
Lennie Mayne	The Three Doctors	65
Lennie Mayne	The Monster of Peladon	73
Lennie Mayne	The Hand of Fear	87
Lovett Bickford	The Leisure Hive	110
Mary Ridge	Terminus	127
Matthew Robinson	Resurrection of the Daleks	134
Matthew Robinson	Attack of the Cybermen	138
Mervyn Pinfield	The Space Museum	15
Mervyn Pinfield & Derek Martinus	Galaxy 4	18
Mervyn Pinfield & Douglas Camfield	Planet of Giants	9
Mervyn Pinfield & Frank Cox	The Sensorites	7
Michael E Briant	Colony in Space	58
Michael E Briant	The Sea Devils	62
Michael E Briant	The Green Death	69
Michael E Briant	Death to the Daleks	72
Michael E Briant	Revenge of the Cybermen	79
Michael E Briant	The Robots of Death	90
Michael Ferguson	The War Machines	27
Michael Ferguson	The Seeds of Death	48
Michael Ferguson	The Ambassadors of Death	53
Michael Ferguson	The Claws of Axos	57
Michael Hart	The Space Pirates	49
Michael Hayes	The Androids of Tara	101
Michael Hayes	The Armageddon Factor	103
Michael Hayes	City of Death	105
Michael Imison	The Ark	23
Michael Kerrigan	Battlefield	156
Michael Leeston-Smith	The Myth Makers	20
Michael Owen Morris	The Awakening	132

Directors	Serial title	Serial
Morris Barry	The Moonbase	33
Morris Barry	The Tomb of the Cybermen	37
Morris Barry	The Dominators	44
Nicholas Mallett	The Mysterious Planet	144
Nicholas Mallett	Paradise Towers	149
Nicholas Mallett	The Curse of Fenric	158
Norman Stewart	Underworld	96
Norman Stewart	The Power of Kroll	102
Paddy Russell	The Massacre	22
Paddy Russell	Invasion of the Dinosaurs	71
Paddy Russell	Pyramids of Mars	82
Paddy Russell	Horror of Fang Rock	92
Paul Bernard	Day of the Daleks	60
Paul Bernard	The Time Monster	64
Paul Bernard & David Maloney	Frontier in Space	67
Paul Joyce	Warriors' Gate	114
Pennant Roberts	The Face of Evil	89
Pennant Roberts	The Sun Makers	95
Pennant Roberts	The Pirate Planet	99
Pennant Roberts	Shada	109
Pennant Roberts	Warriors of the Deep	131
Pennant Roberts	Timelash	142
Peter Grimwade	Full Circle	112
Peter Grimwade	Logopolis	116
Peter Grimwade	Kinda	119
Peter Grimwade	Earthshock	122
Peter Moffatt	State of Decay	113
Peter Moffatt	The Visitation	120
Peter Moffatt	Mawdryn Undead	126
Peter Moffatt	The Five Doctors	130
Peter Moffatt	The Twin Dilemma	137
Peter Moffatt	The Two Doctors	141
Rex Tucker	The Gunfighters	25
Richard Clark	Gridlock	185
Richard Clark	The Lazarus Experiment	187
Richard Martin	The Dalek Invasion of Earth	10
Richard Martin	The Web Planet	13
Richard Martin	The Chase	16
Richard Martin & Christopher Barry	The Daleks	2
Richard Martin & Frank Cox	The Edge of Destruction	3

Directors	Serial title	Serial
Rodney Bennett	The Ark in Space	76
Rodney Bennett	The Sontaran Experiment	77
Rodney Bennett	The Masque of Mandragora	86
Ron Jones	Black Orchid	121
Ron Jones	Time-Flight	123
Ron Jones	Arc of Infinity	124
Ron Jones	Frontios	133
Ron Jones	Vengeance on Varos	139
Ron Jones	Mindwarp	145
Sarah Hellings	The Mark of the Rani	140
Terence Dudley	Meglos	111
Timothy Combe	The Silurians	52
Timothy Combe	The Mind of Evil	56
Timothy Combe & Derek Martinus	The Evil of the Daleks	36
Tony Virgo	The King's Demons	129
Tristan de Vere Cole	The Wheel in Space	43
Waris Hussein	An Unearthly Child	1
Waris Hussein & John Crockett	Marco Polo	4

[1] Given that my analysis draws primarily on dialogue and action (rather than music, design etc), I have only listed the directors and writers and not other major crew roles. Producers and script editors are listed in Appendix A (Sources: BBC, 2009a, 2009b; IMDB, 2008).

[2] The writers and directors who were not credited were usually either fulfilling other crew roles such as producer or script editor at the time (e.g. Sherwin, Dicks, Letts) or contributed only small parts of serials (e.g. Pinfield, Maloney). The primary source for these notes is the BBC website (2009a), which in turn draws on other sources. No annotations of this kind are available for the new series at its official website (BBC, 2009a), so it has no notes column.

[3] Episodes of new series multi-episode serials are listed together, since the writers and directors were consistent throughout, with the exceptions of *Silence in the Library/Forest of the Dead* and *Utopia/The Sound of Drums/Last of the Time Lords*, for which episodes had different directors.

[4] Serials with more than one writer are listed under all writer names, except where secondary writers are always found with the same primary writer (in writing teams such as Pip & Jane Baker or by chance), in which case stories are not listed under the secondary writers' names. About 77 writers/writing teams worked on the series to the end of 2008.

[5] All serials with more than one director are listed following the same principle as the writers in Appendix B2. 73 directors worked on the series to the end of 2008.

APPENDIX C
DOCTOR WHO SERIALS AND EPISODES SORTED BY TITLE

Serial title	Doctor	Season	Year	Serial
42	10 David Tennant	Series 3	07	188
Aliens of London	9 Christopher Eccleston	Series 1	05	164
An Unearthly Child	1 William Hartnell	1	63	1
Arc of Infinity	5 Peter Davison	20	83	124
Army of Ghosts	10 David Tennant	Series 2	06	181
Attack of the Cybermen	6 Colin Baker	22	85	138
Bad Wolf	9 Christopher Eccleston	Series 1	05	170
Battlefield	7 Sylvester McCoy	26	89	156
Black Orchid	5 Peter Davison	19	82	121
Blink	10 David Tennant	Series 3	07	190
Boom Town	9 Christopher Eccleston	Series 1	05	169
Carnival of Monsters	3 Jon Pertwee	10	73	66
Castrovalva	5 Peter Davison	19	82	117
City of Death	4 Tom Baker	17	79	105
Colony in Space	3 Jon Pertwee	8	71	58
Dalek	9 Christopher Eccleston	Series 1	05	165
Daleks in Manhattan	10 David Tennant	Series 3	07	186
Day of the Daleks	3 Jon Pertwee	9	72	60
Death to the Daleks	3 Jon Pertwee	11	74	72
Delta and the Bannermen	7 Sylvester McCoy	24	87	150
Destiny of the Daleks	4 Tom Baker	17	79	104
Doomsday	10 David Tennant	Series 2	06	181
Dragonfire	7 Sylvester McCoy	24	87	151
Earthshock	5 Peter Davison	19	82	122
Enlightenment	5 Peter Davison	20	83	128
Evolution of the Daleks	10 David Tennant	Series 3	07	186
Father's Day	9 Christopher Eccleston	Series 1	05	167
Fear Her	10 David Tennant	Series 2	06	180
Forest of the Dead	10 David Tennant	Series 4	08	199
Four to Doomsday	5 Peter Davison	19	82	118
Frontier in Space	3 Jon Pertwee	10	73	67
Frontios	5 Peter Davison	21	84	133
Full Circle	4 Tom Baker	18	80	112
Fury from the Deep	2 Patrick Troughton	5	68	42
Galaxy 4	1 William Hartnell	3	65	18
Genesis of the Daleks	4 Tom Baker	12	75	78
Ghost Light	7 Sylvester McCoy	26	89	157
Gridlock	10 David Tennant	Series 3	07	185
Horror of Fang Rock	4 Tom Baker	15	77	92
Human Nature	10 David Tennant	Series 3	07	189
Image of the Fendahl	4 Tom Baker	15	77	94
Inferno	3 Jon Pertwee	7	70	54
Invasion of the Dinosaurs	3 Jon Pertwee	11	74	71
Journey's End	10 David Tennant	Series 4	08	202
Kinda	5 Peter Davison	19	82	119
Last of the Time Lords	10 David Tennant	Series 3	07	191
Logopolis	4 Tom Baker	18	81	116
Love & Monsters	10 David Tennant	Series 2	06	179
Marco Polo	1 William Hartnell	1	64	4
Mawdryn Undead	5 Peter Davison	20	83	126
Meglos	4 Tom Baker	18	80	111
Midnight	10 David Tennant	Series 4	08	200

Serial title	Doctor	Season	Year	Serial
Mindwarp	6 Colin Baker	23	86	145
Mission to the Unknown	1 William Hartnell	3	65	19
New Earth	10 David Tennant	Series 2	06	172
Nightmare of Eden	4 Tom Baker	17	79	107
Paradise Towers	7 Sylvester McCoy	24	87	149
Partners in Crime	10 David Tennant	Series 4	08	193
Planet of Evil	4 Tom Baker	13	75	81
Planet of Fire	5 Peter Davison	21	84	135
Planet of Giants	1 William Hartnell	2	64	9
Planet of the Daleks	3 Jon Pertwee	10	73	68
Planet of the Ood	10 David Tennant	Series 4	08	195
Planet of the Spiders	3 Jon Pertwee	11	74	74
Pyramids of Mars	4 Tom Baker	13	75	82
Remembrance of the Daleks	7 Sylvester McCoy	25	88	152
Resurrection of the Daleks	5 Peter Davison	21	84	134
Revelation of the Daleks	6 Colin Baker	22	85	143
Revenge of the Cybermen	4 Tom Baker	12	75	79
Rise of the Cybermen	10 David Tennant	Series 2	06	176
Robot	4 Tom Baker	12	74-5	75
Rose	9 Christopher Eccleston	Series 1	05	161
School Reunion	10 David Tennant	Series 2	06	174
Shada	4 Tom Baker	17	80	109
Silence in the Library	10 David Tennant	Series 4	08	199
Silver Nemesis	7 Sylvester McCoy	25	88	154
Smith and Jones	10 David Tennant	Series 3	07	183
Snakedance	5 Peter Davison	20	83	125
Spearhead from Space	3 Jon Pertwee	7	70	51
State of Decay	4 Tom Baker	18	80	113
Survival	7 Sylvester McCoy	26	89	159
Terminus	5 Peter Davison	20	83	127
Terror of the Autons	3 Jon Pertwee	8	71	55
Terror of the Vervoids	6 Colin Baker	23	86	146
Terror of the Zygons	4 Tom Baker	13	75	80
The Abominable Snowmen	2 Patrick Troughton	5	67	38
The Age of Steel	10 David Tennant	Series 2	06	176
The Ambassadors of Death	3 Jon Pertwee	7	70	53
The Android Invasion	4 Tom Baker	13	75	83
The Androids of Tara	4 Tom Baker	16	78	101
The Ark	1 William Hartnell	3	66	23
The Ark in Space	4 Tom Baker	12	75	76
The Armageddon Factor	4 Tom Baker	16	79	103
The Awakening	5 Peter Davison	21	84	132
The Aztecs	1 William Hartnell	1	64	6
The Brain of Morbius	4 Tom Baker	13	76	84
The Caves of Androzani	5 Peter Davison	21	84	136
The Celestial Toymaker	1 William Hartnell	3	66	24
The Chase	1 William Hartnell	2	65	16
The Christmas Invasion	10 David Tennant	Xmas 1	05	171
The Claws of Axos	3 Jon Pertwee	8	71	57
The Creature from the Pit	4 Tom Baker	17	79	106
The Crusade	1 William Hartnell	2	65	14
The Curse of Fenric	7 Sylvester McCoy	26	89	158
The Curse of Peladon	3 Jon Pertwee	9	72	61
The Daemons	3 Jon Pertwee	8	71	59
The Dalek Invasion of Earth	1 William Hartnell	2	64	10

Serial title	Doctor	Season	Year	Serial
The Daleks	1 William Hartnell	1	63-4	2
The Daleks' Master Plan	1 William Hartnell	3	65-6	21
The Deadly Assassin	4 Tom Baker	14	76	88
The Doctor Dances	9 Christopher Eccleston	Series 1	05	168
The Doctor's Daughter	10 David Tennant	Series 4	08	197
The Dominators	2 Patrick Troughton	6	68	44
The Edge of Destruction	1 William Hartnell	1	64	3
The Empty Child	9 Christopher Eccleston	Series 1	05	168
The End of the World	9 Christopher Eccleston	Series 1	05	162
The Enemy of the World	2 Patrick Troughton	5	67-8	40
The Evil of the Daleks	2 Patrick Troughton	4	67	36
The Face of Evil	4 Tom Baker	14	77	89
The Faceless Ones	2 Patrick Troughton	4	67	35
The Family of Blood	10 David Tennant	Series 3	07	189
The Fires of Pompeii	10 David Tennant	Series 4	08	194
The Five Doctors	5 Peter Davison	Special	83	130
The Girl in the Fireplace	10 David Tennant	Series 2	06	175
The Greatest Show in the Galaxy	7 Sylvester McCoy	25	88	155
The Green Death	3 Jon Pertwee	10	73	69
The Gunfighters	1 William Hartnell	3	66	25
The Hand of Fear	4 Tom Baker	14	76	87
The Happiness Patrol	7 Sylvester McCoy	25	88	153
The Highlanders	2 Patrick Troughton	4	66-7	31
The Horns of Nimon	4 Tom Baker	17	79-80	108
The Ice Warriors	2 Patrick Troughton	5	67	39
The Idiot's Lantern	10 David Tennant	Series 2	06	177
The Impossible Planet	10 David Tennant	Series 2	06	178
The Invasion	2 Patrick Troughton	6	68	46
The Invasion of Time	4 Tom Baker	15	78	97
The Invisible Enemy	4 Tom Baker	15	77	93
The Keeper of Traken	4 Tom Baker	18	81	115
The Keys of Marinus	1 William Hartnell	1	64	5
The King's Demons	5 Peter Davison	20	83	129
The Krotons	2 Patrick Troughton	6	68-9	47
The Lazarus Experiment	10 David Tennant	Series 3	07	187
The Leisure Hive	4 Tom Baker	18	80	110
The Long Game	9 Christopher Eccleston	Series 1	05	166
The Macra Terror	2 Patrick Troughton	4	67	34
The Mark of the Rani	6 Colin Baker	22	85	140
The Masque of Mandragora	4 Tom Baker	14	76	86
The Massacre	1 William Hartnell	3	66	22
The Mind of Evil	3 Jon Pertwee	8	71	56
The Mind Robber	2 Patrick Troughton	6	68	45
The Monster of Peladon	3 Jon Pertwee	11	74	73
The Moonbase	2 Patrick Troughton	4	67	33
The Mutants	3 Jon Pertwee	9	72	63
The Mysterious Planet	6 Colin Baker	23	86	144
The Myth Makers	1 William Hartnell	3	65	20
The Next Doctor	10 David Tennant	Xmas 4	08	203
The Parting of the Ways	9 Christopher Eccleston	Series 1	05	170
The Pirate Planet	4 Tom Baker	16	78	99
The Poison Sky	10 David Tennant	Series 4	08	196
The Power of Kroll	4 Tom Baker	16	78-9	102
The Power of the Daleks	2 Patrick Troughton	4	66	30
The Reign of Terror	1 William Hartnell	1	64	8

Serial title	Doctor	Season	Year	Serial
The Rescue	1 William Hartnell	2	65	11
The Ribos Operation	4 Tom Baker	16	78	98
The Robots of Death	4 Tom Baker	14	77	90
The Romans	1 William Hartnell	2	65	12
The Runaway Bride	10 David Tennant	Xmas 2	06	182
The Satan Pit	10 David Tennant	Series 2	06	178
The Savages	1 William Hartnell	3	66	26
The Sea Devils	3 Jon Pertwee	9	72	62
The Seeds of Death	2 Patrick Troughton	6	69	48
The Seeds of Doom	4 Tom Baker	13	76	85
The Sensorites	1 William Hartnell	1	64	7
The Shakespeare Code	10 David Tennant	Series 3	07	184
The Silurians	3 Jon Pertwee	7	70	52
The Smugglers	1 William Hartnell	4	66	28
The Sontaran Experiment	4 Tom Baker	12	75	77
The Sontaran Stratagem	10 David Tennant	Series 4	08	196
The Sound of Drums	10 David Tennant	Series 3	07	191
The Space Museum	1 William Hartnell	2	65	15
The Space Pirates	2 Patrick Troughton	6	69	49
The Stolen Earth	10 David Tennant	Series 4	08	202
The Stones of Blood	4 Tom Baker	16	78	100
The Sun Makers	4 Tom Baker	15	77	95
The Talons of Weng-Chiang	4 Tom Baker	14	77	91
The Tenth Planet	1 William Hartnell	4	66	29
The Three Doctors	3 Jon Pertwee	10	72-3	65
The Time Meddler	1 William Hartnell	2	65	17
The Time Monster	3 Jon Pertwee	9	72	64
The Time Warrior	3 Jon Pertwee	11	73-4	70
The Tomb of the Cybermen	2 Patrick Troughton	5	67	37
The Twin Dilemma	6 Colin Baker	21	84	137
The Two Doctors	6 Colin Baker	22	85	141
The Ultimate Foe	6 Colin Baker	23	86	147
The Underwater Menace	2 Patrick Troughton	4	67	32
The Unicorn and the Wasp	10 David Tennant	Series 4	08	198
The Unquiet Dead	9 Christopher Eccleston	Series 1	05	163
The Visitation	5 Peter Davison	19	82	120
The War Games	2 Patrick Troughton	6	69	50
The War Machines	1 William Hartnell	3	66	27
The Web of Fear	2 Patrick Troughton	5	68	41
The Web Planet	1 William Hartnell	2	65	13
The Wheel in Space	2 Patrick Troughton	5	68	43
Time and the Rani	7 Sylvester McCoy	24	87	148
Time-Flight	5 Peter Davison	19	82	123
Timelash	6 Colin Baker	22	85	142
Tooth and Claw	10 David Tennant	Series 2	06	173
Turn Left	10 David Tennant	Series 4	08	201
Underworld	4 Tom Baker	15	78	96
Utopia	10 David Tennant	Series 3	07	191
Vengeance on Varos	6 Colin Baker	22	85	139
Voyage of the Damned	10 David Tennant	Xmas 3	07	192
Warriors of the Deep	5 Peter Davison	21	84	131
Warriors' Gate	4 Tom Baker	18	81	114
World War III	9 Christopher Eccleston	Series 1	05	164

APPENDIX D MANUSCRIPT ACCEPTED FOR PUBLICATION IN THE *JOURNAL OF COMMONWEALTH LITERATURE*

During the thesis-writing period I wrote a manuscript entitled 'Sociopathetic abscess or yawning chasm? The absent postcolonial transition in *Doctor Who*' and submitted it to the *Journal of Commonwealth Literature*. In December 2009 the journal accepted the manuscript for publication in 2010. The following is the manuscript as originally submitted.

Parts of the paper draw on material from thesis chapters, particularly Chapter 5, but since its focus is representations of colonialism, cosmopolitanism and postcolonial materiality in *Doctor Who* — i.e. not topics that are at the centre of this thesis — I did not include it in the body of the thesis in its entirety.

Sociopathetic abscess or yawning chasm?
The absent postcolonial transition in *Doctor Who*

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Abstract
This paper explores discourses of colonialism, cosmopolitanism and postcolonialism in the long-running television series, *Doctor Who*. *Doctor Who* has frequently explored past colonial scenarios and has depicted cosmopolitan futures as multiracial and queer-positive, constructing a teleological model of human history. Yet postcolonial transition stages between the overthrow of colonialism and the instatement of cosmopolitan polities have received little attention within the program. This apparent 'yawning chasm' — this inability to acknowledge the material realities of an inequitable postcolonial world shaped by exploitative trade practices, diasporic trauma and racist discrimination — is whitewashed by the representation of past, present and future humanity as unchangingly diverse; literally fixed in happy demographic variety. Harmonious cosmopolitanism is thus presented as a non-negotiable fact of human inevitability, casting instances of racist oppression as unnatural blips. Under this construction, the postcolonial transition needs no explication, because to throw off colonialism's chains is merely to revert to a more natural state of humanness, that is, cosmopolitanism. Only a few *Doctor Who* stories break with this model to deal with the 'sociopathetic abscess' that is real life postcolonial modernity.

Key Words
Doctor Who, cosmopolitanism, colonialism, postcolonialism, race, teleology, science fiction

1. Introduction

Zargo: In any society there is bound to be a division. The rulers and the ruled.
The Doctor: A division? Yawning chasm, I'd say. Wouldn't you?
Romana: No, I'd say a sociopathetic abscess.
The Doctor: Oh, I wish I'd thought of that. That's a good diagnosis. Yes, I've never seen such a state of decay.

-- *Doctor Who, State of Decay* (1980)

Themes of colonialism and cosmopolitanism make frequent appearances in the science fiction television series, *Doctor Who*. While colonialism stories reference the 20th century past, they are almost always explored through the allegorical device of future human colonies on alien planets. On the other hand, a multiracial cosmopolitanism is represented literally, as a glimpse of what the present world looks like or as the future destination of humanity. Together, these elements of *Doctor Who* tell a teleological tale of human history, beginning with colonialism, proceeding with the overthrow of colonial regimes, and ending up with cosmopolitanism. But there is a glaring omission in this tale: depictions of what happens *after* a colonialist enterprise is overthrown, but *before* a cosmopolitan society of harmonious diversity is established. Inequitable and oppressive postcolonial realities that infest the real world of the present day — exploitative trade practices, biopiracy and resource theft, chronic global diseases with insufficient resources for treatment, diasporic trauma, and racist discrimination to name a few — receive scant attention in *Doctor Who*.

Writer Terrance Dicks' script for the *Doctor Who* serial *State of Decay*, quoted above, offers two metaphors for structural oppression — *the yawning chasm* and *the sociopathetic abscess* — which are useful for characterising this glaring omission. In a world whose dominant belief systems subscribe to cosmopolitan ideals that have not materialised, postcolonial realities are well characterized as a sociopathetic abscess. *Doctor Who*'s virtual omission of this festering blight then seems a yawning chasm in its telling of the teleological tale. This paper examines the philosophical and political commitments of *Doctor Who* that make sense of this observation and touches on its significance in terms of real world politics of race.

Doctor Who is the longest running science fiction television series in the world.[1] Produced in the UK by the BBC, the original series of the program ran almost continuously in 26 seasons between 1963 and 1989.[2] The program was revived in a new series in 2005, with a season produced each year since then.[3] *Doctor Who* is serialized, with each season comprising 1-10 stand-alone serials made up of 1-12 episodes.[4] While the original series achieved cult status during the 20th century, the new series rapidly garnered enormous popularity in the 21st, and has won at least 39 awards.[5]

The program features a central character called 'The Doctor'. The Doctor is a Time Lord from a scientifically 'advanced' planet and he travels through time and space in a ship called the TARDIS. The Doctor almost always travels with one or more companions who are frequently humans from contemporary Earth. The companions' dramaturgical function is to provide an identification point for viewers.[6] The Doctor's body is able to completely regenerate if he is ever killed, and this device has allowed the program to continue for nearly half a century with different actors playing the part, all of who have been white men. *Doctor Who* was originally conceived as a children's semi-educational drama about history and science,[7] and in mid-1960s serials the Doctor was portrayed as a scientist adventurer, travelling the universe to study it. But since the late 60s, although he has ostensibly remained a scientist, he has been characterized more as a freedom fighter, using the opportunities presented by his travels to right wrongs.

In the following, I first review *Doctor Who*'s depictions of colonialism and cosmopolitanism and their political implications. I then offer interpretations for the existence of the yawning chasm where the postcolonial transition should be in the teleological timeline between colonialism's end and cosmopolitanism's beginning. I take as a given that the imposition of a Western linear model of history on colonial subjects — particularly stagist teleology — is problematic because of its fundamentalist Eurocentrism and its employment as a tool of oppressive governmentality.[8] My aim is not to reinforce this model by demanding that the timeline from past to future be completed. Rather, I seek to draw attention to its inadequacy by identifying the reason for the gap in *Doctor Who*'s timeline: the program's underlying commitment to an essentialist view of humanity. Despite the teleological model's (racist and deterministic) pretensions to human developmentalism, it is utterly ahistorical, and cannot cope with the possibility of historicism that postcolonial challenges introduce. I finish by discussing *Doctor Who*'s limited but significant representations of the postcolonial sociopathetic abscess — the diverse but specific material uncertainties and horrors of contemporary existence that are attributable in some way to colonialism and its fallout and have no easy remedy — to highlight the necessity of finding new, non-teleological models, including new ways of conceiving of postcolonialism itself.[9]

2. Colonialism and Cosmopolitanism in *Doctor Who*

Colonialism

As Alec Charles notes in his critique of *Doctor Who*'s representations of colonialism and anti-colonialism, scores of peoples and nations achieved independence from Britain during the 1940s, 50s and 60s.[10] With its genesis in 1963, it may come as no surprise that *Doctor Who* has dealt with anti-colonialist themes reasonably frequently throughout its history, starting in its first season and continuing in the new series. A handful of serials reference the role of English scientist-explorers in real world colonial enterprises, for example in Egypt (*Pyramids of Mars* (1975)), the Amazon basin (*Black Orchid* (1982)) and central Africa (*Ghost Light* (1989)). In all cases, the colonial projects have dire consequences for the colonizers, sending the scientist-explorers mad. But few of these serials are *about* colonialism as such, rather focusing on other issues, and consequently their attitude to colonialism is somewhat ambiguous.

There are a number of serials that explore colonial scenarios in depth though. The most obvious engagement with these themes is in six serials featuring colonial situations in crisis: *The Sensorites* (1964), *The Space Museum* (1965), *The Mutants* (1972), *The Power of Kroll* (1978), *Kinda* (1982) and *Planet of the Ood* (2008). Two of these take place at the moment where colonialism threatens (*The Sensorites, Kinda*) and are resolved with human (or human-like) proto-colonizers quietly agreeing to leave, never to return. The other four deal with long-standing colonial situations, and are resolved via an indigenous uprising that forces colonizers off the planet. In all six of these stories, colonizer and colonized are shown to be incompatible cohabitants, and the colonized reclaim self-determination.

Two colonialism-themed *Doctor Who* serials conclude differently, with colonizers and colonized reconciling: *The Savages* (1966) and *The Happiness Patrol* (1988). In each case, one or more institutions of oppression (government, justice system, machinery for extracting 'life force' from the colonized) are destroyed by the end of the story, toppling an oppressive regime and resolving the problem. In both cases this results from an uprising by exploited peoples. In *The Savages* it is the colonized themselves who revolt, but in *The Happiness Patrol* the revolutionaries are working class members of the colonizer citizenry, and the colonized people (the "Pipe People") are not the primary focus of the story. The Pipe People's views on colonization are not clear, although the oppressive regime has caused their near starvation. However, the

denouement to both stories suggests that colonizers and colonized will live together in harmony under a new regime.

Three serials have taken a contrary position to these anti-colonialist tales. *The Aztecs* (1964), *Colony in Space* (1971) and *The Curse of Peladon* (1972) all implicitly justify colonialism on the grounds that the colonized are 'savages' in need of 'civilization'.[11] In *The Aztecs*, set just prior to Cortes's conquest, the Doctor's historian companion Barbara tries to save the people from their "barbarous" selves by preventing the practice of human sacrifices. She does this in the belief that by cultivating the "civilized" side of Aztec culture, she can alter the Conquistadors' negative perception of the Aztecs and thus prevent the conquest from ever occurring. Barbara gives up when the Aztecs fail to rise to her challenge, surrendering to the inevitability of the fate that the Aztecs appear to bring on themselves. Similarly, *The Curse of Peladon* concerns a 'medieval' world governed by religion. Its rational, atheist king fights against the dominance of religious orthodoxy by inviting an interstellar, UN-like Federation to intellectually colonize his planet, in order to raise his people from the "barbarism" of superstition and ignorance. The Federation are only too happy to oblige. *Colony in Space* concerns three parties: a tribe of indigenous "Primitives", a small community of alternative lifestyle colonizers seeking refuge from an overpopulated Earth, and the Interplanetary Mining Corporation come to plunder the planet of its minerals. The Primitives (as they are called) are the mute, brown- and green-skinned descendants of a once great but foolish civilization which declined under destructive and poisonous technologization; they have lost their science and replaced it with religion. The story is resolved by the self sacrifice of the Primitives at the behest of their voiced, white-skinned leader, who considers his people doomed because of their failure to make enlightened choices years before. The concurrent bringing to justice of the evil mining corporation leaves the planet conveniently empty for colonization by the Earthlings.

Common to these three types of serials (anti-colonialism, reconciliation, pro-colonialism) is a judgement about the worthiness of the colonized to self-govern. Since in each case colonizers use science and technology to exploit the colonized world, evidence of worthiness often comes in the form of conformity to Western-style 'scientific enlightenment'.[12] Thus, the indigenous Sensorites are shown to be scientifically competent, with their own laboratories and experimental scientists (*The Sensorites*). The colonized Xerons agree to heed the Doctor's injunction not to "lose sight of science altogether" while they dismantle the science museum that is the masters' primary tool of oppression (*The Space Museum*). The oppressed "Savages" reveal that they too had "science" before the oppressive "Elders" started sapping their life force (*The Savages*). In *The Mutants*, on off-world anthropologist finds evidence of the indigenous Mutts' sophisticated scientific knowledge, now lost due to colonization. The indigenous Kinda have necklaces resembling the DNA double helix, and have the ability to engineer complex audio-psychological technology, causing the Doctor to admire them as "very sophisticated people" (*Kinda*). The Peladonians are willing to become scientific instead of superstitious (*The Curse of Peladon*), so Peladon retains a large degree of autonomy even while voluntarily remaining under the intellectual mentorship of the Federation. On the other hand, both the Aztecs and the *Colony in Space* Primitives fail when offered the opportunity to follow a Western rationalist path, instead reverting to superstitious beliefs; thus they prove their unworthiness to even exist let alone self-govern.

This calls to mind the ideological viewpoint commonly known as *terra nullius*, which considers the exploitation of nature to be intrinsic to the state of being human,[13] and so dismisses the property rights and polities of those people whose nature exploiting activities do not conform to Western standards.[14] Accordingly, the rejection of *terra nullius* has been rhetorically important in legal battles for indigenous land

justice.[15] By conferring self-determination only on those with the 'correct' attitude to rationalist science and technology, *Doctor Who* implicitly justifies *terra nullius*-influenced dispossession.

The Power of Kroll, *The Happiness Patrol* and *Planet of the Ood* are exceptions to this pattern to some extent. None of the colonized races in these serials visibly possess Western-style science and technology, yet their entitlement to self-determination is more or less endorsed by the Doctor, and hence, by the program's authors. There are caveats to this though. The pipe people in *The Happiness Patrol* remain stuck with the colonizers, so self-determination is less clear for them. The colonized "Swampies" in *The Power of Kroll* reveal that they have *chosen* to inhabit the planet and live their 'simple' life — they did not end up there through chance and indigeneity — implying that their non-technologized lifestyle is not a deficit borne of 'ignorance' but rather a decision based on 'enlightened reason': they are 'Westerners' going back to nature.

The Ood, the most recently depicted colonized subjects, may simply be exceptional, but again there are caveats to this diagnosis. The Doctor remarks that the Ood's planet is near to the Sensorites' planet and that the two species are likely related, perhaps suggesting that the Ood are closer to rationalist technologization than they appear. The Ood ultimately prove their worthiness to self-govern another way: by offering religious-style tribute to the Doctor and companion Donna. The Doctor and Donna — human-like and human — resemble the colonizers (who are human) and do little but stand in solidarity with the Ood. Yet the Ood all but worship them. The Doctor obnoxiously asks for the privilege of pulling the switch that effects the Ood's liberation and his wish is granted, thus depriving the colonized of their own symbolic moment. At the end of the serial, the Doctor and Donna are given a glorious send-off with their very own hymn-like Ood song, and as they climb, Christ-like, into the TARDIS for literal ascension into the heavens, they are told their input will never be forgotten. By directing their religious energy in a rationalist direction, towards the scientifically minded Doctor — and by offering appropriate gratitude towards the benevolent bearers of the white man's burden —the Ood prove themselves worthy too.

Under this 'rationalist civilization' paradigm for judging cultures, the rational gain entrance to humanity; the irrational are swept aside. This model is both deterministic and essentialist, positing an inevitable predestination for humanity in a Western-style cosmopolitan future. The importance of this becomes clearer in the next section.

Cosmopolitanism

The postcolonial migration from former colonies into Europe, North America and Australasia that accompanied and followed independence movements has expanded and consolidated multicultural communities in the West. Multiraciality and to a lesser extent multiethnicity, in combination with heightened consciousness about gender and sexual diversity — in short, cosmopolitanism(s) — have become intrinsic to representations of both contemporary British society and future human societies in the new series of *Doctor Who*. Vaguely cosmopolitan ideas were present in the original series, manifesting as multiracial and/or multiethnic human futures and presents, or as global internationalist scientific collaborations.[16] But they were often tokenistic and were far from standard: unlike the new series, there are many original series depictions of human futures and presents that are unself-consciously monocultural and tediously white. For this reason, this section draws on cosmopolitan representations in the new series to gauge the program's emerging hypothesis of human history.

The Doctor's six companions[17] in the new series are themselves drawn from a cosmopolitan vision. Almost all are from London in the present; the exception is companion Jack, an openly bisexual white man from Earth's future. The others are white working class Rose who lives on a housing estate and works in a shop, her black

boyfriend Mickey from the same estate, Rose's gyro-collecting white mum Jackie, black medical student Martha, and ginger-haired temp Donna. In other words, all the Doctor's companions are black, queer and/or working class. Jack, who features more prominently in the spin-off series *Torchwood*,[18] has been hailed as television's first bisexual male hero.[19] Martha was hailed as *Doctor Who*'s first black (and first non-white) companion when she was cast in 2006.[20] Questions about the status of Mickey as companion have since thrown that claim into dispute;[21] regardless, Jack, Martha and Mickey all stand in contrast to the original series companions, who were definitely all white and none of whom were openly queer.[22] While working class companions had appeared before, none were unskilled workers nor chronically under- or unemployed like Rose, Donna and Jackie. Non-continuing black, Asian and queer characters have peppered at least 15 stories set in Earth's present, contributing to the representation of 21st century Britain as an unself-consciously diverse and liberal cosmopolis.[23]

Representations of humanity's future in 14 serials of the new series are multiracial in casting, featuring black and Asian actors, if not multiethnic in characterisation.[24] At least three of these serials also contain queer characters.[25] But while these cosmopolitan futures embrace diversity, they are not utopian.[26] Almost all these stories take place within a version of capitalism, in which ethical standards are breached for the sake of wealth and class snobbery is commonplace. Difference must be defended against the threat of the enemy Cybermen, who wish to make everyone the same by removing "sex and class and colour and creed" (*The Rise of the Cybermen* (2006)). Cyborgs face relationship discrimination in a transparent metaphor for queer struggles (*Voyage of the Damned* (2007)). In other words, these representations of future social diversity do not depict speculative possibilites so much as a version of 21st century urban Western reality, extended into the future and expanded to encompass the whole planet / galaxy / universe.

But in this future, all the peoples of the Earth form a vast monolithic community with no pockets of divergent culture or alternative lifestyles. There are no images of Maasai dancers in the Great Rift Valley, no Pitjantjatjara ceremonies at Uluru. There are no battles for cultural dominance; it seems the West has already won that fight, because the future most closely resembles the West. The world — the universe — is one great cosmopolis in which all comers jostle shoulder to shoulder in the same old crappy jobs, retaining their mohawks or pinstripe, their skin tones and sexual proclivities, their different species, solely as a matter of personal taste and mundane variation. Class snobbery is fought, but class differences are implicitly embraced as part of the rich tapestry of human life. Thus, diversity is a non-negotiable fact in the future as in new *Doctor Who*'s present. But it is a fact that has lost all of its history and deeper political significance, rendering differences trivial rather than loaded.

The new series also represents Earth's *past* as a place of happy and benign diversity. Depression-era New York contains mixed-race shanty towns led by a black man (*Daleks in Manhattan* (2007)). Black women populate the streets and royal courts of Victorian England and Enlightenment France (*The Next Doctor* (2008), *The Girl in the Fireplace* (2006)). The 1920s, 40s and 50s are populated with gay men (*The Unicorn and the Wasp* (2008), *The Empty Child* (2005), *The Idiot's Lantern* (2006)). In *The Shakespeare Code* (2007), set in London in 1599, Martha worries about her safety in an era of slavery, but the Doctor reassures her that the world is actually as colour-blind as he is:

Martha:	Oh, but hold on. Am I alright? I'm not going to get carted off as a slave am I?
The Doctor:	Why would they do that?
Martha:	Not exactly white, in case you hadn't noticed.

The Doctor: I'm not even human. Just walk about like you own the place, works for me. Besides, you'd be surprised.
(Ahead of them, black women walk amongst the crowd, clearly at home and safe.)
The Doctor: Elizabethan England - not so different from your time. Look over there --
(The Doctor points to someone scooping manure, people talking over a barrel of ale, a street preacher forecasting hellfire and damnation.)
The Doctor: They've got recycling. Water cooler rumour. Global warming . . .
(And soon after, at the Globe Theatre, the Doctor and Martha applaud Shakespearean actors.)
Martha: And those are men dressed as women, yeah?
The Doctor: London never changes.

With this, the past, present and future all begin to look remarkably alike.

This consistency in *what humanity looks like* constructs human diversity as an unremarkable and timeless fact. It casts racist and homophobic attitudes as threatening, but in the grand scheme of human history, anomalous. The urge to a cosmopolitanism of 'many colours one culture' is thus naturalized and essentialized. There are no deep power relations; there is only the eternal humanity, different in colour but united in all other respects. This is no melting pot, it is no salad bowl: the appropriate metaphor comes from *Doctor Who*'s most famous foodstuff: humanity is so many coloured jelly babies united inside a colourless (white) paper bag.

3. Yawning chasm or sociopathetic abscess?

The yawning chasm between the colonial and the cosmopolitan

Despite its apparently eager engagement with representations of colonialism and cosmopolitanism, *Doctor Who* has a dearth of material dealing with what comes in between: the messy transition from purgatory to paradise in which indigenous peoples, the diasporic descendents of slaves and refugees, members of migrant communities, and the subaltern descendants of the colonizers must all negotiate new ways of living together in a context of continuing structural inequality and oppression. The sociopathetic abscess that is 21st century postcolonial existence is rendered largely invisible in *Doctor Who*, and a yawning chasm of nothing appears in its place.

One of the reasons for this chasm is that there is no straightforward linear temporal relationship between a colonial past, postcolonial present and cosmopolitan future in *Doctor Who*, since most representations of colonialism take place in humanity's future. There are no serials about the independence movements in Africa and the Caribbean to precede Martha and Mickey's diasporic existence in contemporary London, and as we have seen, even Martha's fear of 16th century slavery is dismissed as misplaced. Colonialism is *concurrent* with cosmopolitanism in humanity's future, and so is unconnected to questions of race; the colonizers in *Doctor Who* can be Asian, black or white, because the colonized are always different species. In *The Savages* this is not true — the colonized and colonizers both look like humans and their species status is not clear — but this serial avoids questions of race another way. While it is an obvious metaphor for colonialist exploitation, its original title was *The White Savages*,[27] and all its characters are white. In this respect there is no difference between an all white solution to colonialism and a multicoloured solution, because the solution is merely an unshackling of all slaves into 'freedom'.

As already noted, the naturalisation of human diversity is another reason for the 'yawning chasm' in *Doctor Who*. In *Utopia* (2007), at the end of the universe, humans have always reverted "to the same basic shape" (as the Doctor says) with the same basic stink (as Jack notes) and the same basic varieties of racial diversity, as we ourselves see. We are still "the fundamental human" in the Doctor's words. If this is what is natural then no wonder there is no postcolonial abscess, for to throw off the chains of colonialism is merely to revert to our natural state: essentialized cosmopolitanism. Race is rendered invisible by its abundance. Cosmopolitanism is when we don't have to think about race anymore. The new series is good at this; it is outstanding at colour-blind, equal opportunity casting, while the original series with a few exceptions failed dismally in this respect.[28] It is a good thing that the new series has effected an improvement — both for actors and for viewers who want to see characters that look like them and the people they know. There are surely great benefits of such colour-blind role modelling,[29] but by and large, *equal opportunity casting* is the beginning and the end of cosmopolitanism in *Doctor Who*. There are also costs of not talking about race, power and history, and why *Doctor Who* predominantly chooses one approach over the other is the question.

The program's adherence to a soft liberal humanist moral landscape may provide an answer.[30] Under this political perspective, it makes no sense for there still to be oppression once people are 'free from slavery', because recognising and eliminating the mistake of racism ought to be enough. The Doctor's battle against evil is perpetual precisely because like other liberals, he does not recognize structural oppression that is everywhere around him. On a space station beset by class hierarchies, his battle is to effect freedom of the press (*The Long Game* (2005)): a worthy cause to be sure, but not the only one. The Doctor's colour-blindness extends to referring to Mickey as "Mickey the idiot", irrespective of the elitist hierarchies of 'smart white doctor vs stupid black estate dweller' he reinforces through this act. Perpetual class oppression ensures ample material for building drama in the program, but it simultaneously renders all oppression invisible, including itself. Exploiting others for profit is naturalized as the evil that folks do. White cosmopolitanism is the same as multicoloured cosmopolitanism. The evil of slavers is the same as the evil of a cosmic squid invading Earth via shop window dummies (*Rose* (2005)). As the Doctor says in *The Curse of Fenric* (1989):

> Evil, evil since the dawn of time . . . The beginning of all beginnings. Two forces, only good and evil. Then chaos. Time is born. Matter. Space. The universe cries out like a newborn. The forces shatter as the universe explodes outwards. Only echoes remain. And yet somehow, somehow, the evil force survives. An intelligence: pure evil.

Thus, the postcolonial hurdles faced by Chinese Londoners in the Victorian gothic tale *The Talons of Weng Chiang* (1977) are erased by an orientalist aesthetic that paints them as opium smoking, superstitious, murderous thugs. They are merely bad people, their motivations shrouded in mystery. In *Black Orchid*, the colonialist botanist mutilated by 'bad Indians' is nursed to health by a tribe of 'good Indians', who even send one of their own back to England to be his carer. Never mind that the botanist defiled and stole a sacred flower from the 'bad Indians' for his classificatory empire. In *Warriors' Gate* (1981), a race of former slave-masters, the Tharils, have themselves now been enslaved by their former slaves, humans. The story ends with companion Romana leaving to help liberate the Tharils. The ideological closure here rests in a liberal humanist framework: it does not deal with consequences, only reverses the table so that again the Doctor and Romana play the role of abolitionist. The humans who fought the Tharils have no voice here — the only humans who speak are slavers. In

other words, slaves themselves have no franchise in administering justice; the only correct action is to fight generic 'evil' wherever it arises.

Even *Turn Left* (2008), a dystopian depiction of an apocalyptic Britain that closes its borders and incarcerates migrants in internment camps, fails to redeem this situation. The story rewrites the events of the previous two seasons of *Doctor Who*, showing how they would have transpired had the Doctor died in an early episode. It explicitly links the death of the Doctor to an oppressive xenophobic regime in which everybody suffers: while migrants are locked up, 'native' Britons become internally displaced people; it is a glaring and unpleasant contrast to the usual cosmopolitan futures seen in the program. At the end, we return with relief to 'real life' when the Doctor's death is prevented after all, and the ordinary paradise of the harmoniously diverse present never looked so good. Although it seems promising, like *Planet of the Ood* this story requires the (white, male, Cockney-accented but by birthright ruling class, ostensibly queer but behaviourally heterosexual, alien but by allegiance human) Doctor to save the day, again raising serious political problems with this white man's burden scenario. It seems that the fate of the universe only rests upon the fate of the Doctor. A deep recognition of the material circumstances of racism is noticeably absent.

But this tells us what the Doctor (and thus, *Doctor Who*) stands for. The Doctor is the symbolic cosmopolitan. His opposition to racism manifests as colour-blindness. He is a hero of liberal individualism from the school of being nice to each other. In travelling from one end of space and time to the other righting wrongs, he paradoxically becomes a fixed certainty, symbolising only Good.[31] He possesses near-omniscience and -omnipotence that scientists and imperialists can only aspire to, but like them his tools are Western science and Western morality. Though ostensibly anti-establishment,[32] this all-encompassing vision makes his cosmopolis equivalent to empire.[33] His job is to perpetually fight the evil that threatens this status quo.

If this is the case, there is no postcolonial sociopathetic abscess because the specific circumstances of evil are supremely irrelevant. Migrant internment is just another problem to be solved. Colonialism is a manifestation of evil but only because bad people did bad things to others. If there are problems after colonization ends, it is because there are still bad people, as there will always be. Slavery was just ignorance, Hitler was a bounder,[34] but everything is alright again now. Evil is thus individualized by its monolithic unity. The Doctor must keep knocking down each instance of generic evil and facing the next: there is no end to it, there is no beginning, there is no middle, there is no locatedness, there is no temporality; there is absolutely no change.

A sociopathetic abscess: when the postcolonial transition becomes present

It would be remiss to offer this analysis and to gloss over the exceptions; they are few but important. *Doctor Who* is a product of many authors over many years. It, at least, is not produced in a universe of its own philosophy: it has change.

In a few serials we are offered glimpses of the sociopathetic abscess. They are remarkable by their presence: they carry rhetorical power because they are so rare in *Doctor Who*. In the new series, two incidents stand out in this regard. The first, in *Human Nature* (2007), places Martha in a maid's job at an English private boys school in 1913, without the presence of the Doctor. Some of the boys make racist remarks about her, but more potently, we bear witness to how things have changed when a white nurse refuses to believe that Martha is a medical student in the future, saying, "Women might train to be doctors, but hardly a skivvy and hardly one of your colour." Martha must then prove herself credible. The scene does sting, but its impact is moderated both by its occurrence in 'the dark ages' of the 20th century, and by the fact that the Doctor is absent, reinforcing even here that his presence is what is needed to make things better.

The second glimpse is more striking. It is almost a throwaway line in *Planet of the Ood*, when the Doctor and Donna discover, to their horror, containers full of thousands of slave Ood, ready for export:

Donna:	A great big empire built on slavery.
The Doctor:	It's not so different from your time.
Donna:	Oi! I haven't got slaves!
The Doctor:	Who d'you think made your clothes?

This statement is highly political in its naming of postcolonial economic arrangements as slavery, pulling no punches to acknowledge that a sociopathetic abscess festers beneath the comfortable cosmopolitanism we want to believe we inhabit. While this story is a metaphor for colonialism more than a literal representation of humanity's future, the first serial to feature the Ood, *The Impossible Planet* (2006), was a cosmopolitan future vision. In it, the Doctor failed to recognise the Ood as slaves, and let them perish. He admits this in *Planet of the Ood* and reckons he "owes them one". Hence, the Ood story is one of the few in *Doctor Who* to link colonialism, the postcolonial transition, and a (retrospectively problematic) cosmopolitan future. This brings the future home: the 'cosmopolitan' humans in *The Impossible Planet* are really 'us' in the West, and we must now consider our options for negotiating a society in which we live side by side with slaves.

But the era of *Doctor Who* that delved most deeply into the sociopathetic abscess was 1988-89, the last two seasons of the original series. It contributed a somewhat social realist aesthetic to the program that had rarely been used before, which set the scene for the new series' assertive engagement with the cosmopolitan aspects of contemporary Western life. The Doctor's companion in this era, Ace, is the most situated of all the original series companions. While we had known aspects of companions' back-stories before, in 16 year old Londoner Ace we are forced to deal with an agonistic relationship to her home suburb of Perivale, and tortured ambivalent feelings towards her mum, who she hates yet feels guilty about. In *Survival* (1989), we visit Perivale and meet some of Ace's teenage friends, including Ange the depressed and hay-feverish animal rights campaigner who thought Ace was either dead or gone to Birmingham. Ace is thus shown to inhabit a very particular time and place: she is not merely human, not merely English, not merely from London, not merely a teenager. There is nothing generic about Ace. She is from *somewhere*, at *some time*, and she is most decidedly *someone*.

Ace is in fact very specifically white. Her whiteness has meaning in the society she inhabits. While there are elements of Ace's tenure on *Doctor Who* that paint a diverse picture without remark — such as the fact that one of Ace's Perivale friends, Shreela, is of South Asian descent — in other places it is problematized. In *Battlefield* (1989), Ace makes friends with a young Asian woman, Shou Yuing. When an evil force uses psychological tricks to turn the two against each other, Ace calls Shou Yuing "a yellow slant eyed —" . . . and does not finish. It is at this point that she and Shou Yuing realise something is wrong and reconcile. But the potency of hearing racist slurs from the mouth of our hero, the tortured child who is the primary point of audience identification, is strong indeed. We know that Ace is opposed to racism because in a previous serial set in 1963, *Remembrance of the Daleks* (1988), she became angry and disillusioned with new white friend Mike when she discovered that his mum wouldn't allow "coloureds" in her boarding house, and that Mike himself belonged to a nationalist organisation. Given this, the racist words that emerge from Ace's mouth suggest an ambivalence in *Doctor Who* about the nature of good and evil and their relationship to racist oppression. Ace is neither purely good nor bad; she is neither the

purely anti-racist hero nor the purely racist villain. She is a product of her society, and it is complicated, so she must be aware of and fight what society does to her. Ace *cannot* be colour-blind in a world in which race matters.

Two further incidents from this era reinforce the material significance of race. In *Remembrance of the Daleks*, the Doctor orders a mug of tea in a café, and discusses the implications of having sugar in it with the black man who works there, John. John notes that his father was a cane cutter. He continues, "If this sugar thing had never started, my great grandfather wouldn't have been kidnapped, chained up and sold in Kingston in the first place. I'd be a African." This colonial history is framed within the context of the postcolonial racist attitudes exhibited by Mike and his mum, humble and ordinary nice white Londoners from the time of *Doctor Who*'s beginnings.[35] It also mirrors the central plot of the serial, a eugenics war between alien Dalek factions. As the Doctor observes, there is no escaping the ripples of the past: they have impacts in the present.

Further postcolonial framing is presented in *Ghost Light*. This complex serial is set in a Victorian mansion in Perivale in the 19th century. Its theme is evolution, and references to British colonialism also abound. The main plot concerns a cosmic taxonomist who dislikes change and wants to destroy the Earth because it evolves and gets 'out of control', ruining his classification of Earth's inhabitants. Colonialism is embodied by a mad explorer resembling Henry Morton Stanley, who searches for himself in 'the interior' of the mansion. These two themes are discursively linked by Ace's contribution to the plot. Ace burnt down the mansion 100 years later at age 13, and in a powerful moment she reveals the reason:

> When I lived in Perivale, me and my best mate, we dossed around together. We'd out-dare each other and things. Skiving off, stupid things. Then they burnt out Manesha's flat. White kids firebombed it. I didn't care anymore.

Ace explains that she jumped the wall of the mansion because she was angry. Inside the house she was frightened by something, so burnt the house to the ground. The nature of the horror, she finds out by the serial's end, is the ghost of the cosmic taxonomist: the haunting spectre of the classificatory gaze which seeks fixed ahistoricism, and cannot cope with the unpredictable and material temporality of evolution and change.

Once the taxonomist is dispensed with, the colonialist explorer leaves the Earth with an assorted rabble of characters: a perpetually mutating alien, a Neanderthal, and a former experimental 'control' who, Pygmalion style, wants to be "lady-like". They are refugees from Western imperialism and science who must deal with and heal each others' particular brands of baggage to survive. This offers a solution to Ace's problem: that her ideal of a cosmopolitan utopia (playing with her friend Manesha) was dashed by the grim realities of postcolonial materiality. Understanding the horror helps her let go of her fear, and shows her that denying reality does not solve the problem. Ace must surrender the teleological myth, but she gains confidence in her ability to cope with whatever is to come. Here, then, finally, is the postcolonial sociopathetic abscess in all its nakedness — racist violence, diasporic trauma, global capitalist 'slavery' — linking past and present with an unknown but promising future.

4. Conclusion

If the serials discussed here are mapped on a timeline of their production dates, they form a more or less linear path of colonialism (predominantly 1960s and 1970s) / postcolonial transition (predominantly 1980s) / cosmopolitan presents and futures (predominantly 2000s). This no doubt maps broad trends in British public political discourse. But of interest is the model of humanity discursively hypothesized by the

dominant stages in the journey. The anti-colonialism stories posit a sameness between colonized and colonizer, avoiding any *terra nullius* doubts we may raise about the capacity of the indigenous to self rule. The cosmopolitanism stories also posit a sameness between all peoples — correction, all people, for there are no different *peoples* in *Doctor Who*'s cosmopolitan future. Not only that, but the new series posits a sameness between all societies, even extending back through time into the 'Age of Reason' era of the African slave trade. All of this combines to form a hypothesis of the essential, cosmopolitan, (Westernized) human. This undoes political work that has sought to problematize such monocultural assumptions, and to articulate the spatial and temporal specificities of colonialism and its consequences.

However, we may take heart in the few *Doctor Who* serials, mostly from the late 1980s but encouragingly also from recent years, that make an effort to honour the historicity of oppression and the sociopathetic abscess that is postcolonial modernity. To heal an abscess one must engage with pus; only by grappling with the pain will we find our way to new futures.[36]

Notes

[1] BBC News, Dr Who 'longest-running sci-fi' (28 September 2006). Retrieved 1 September 2009 at news.bbc.co.uk/2/hi/entertainment/5390372.stm.

[2] Verity Lambert, prod., *Doctor Who*, BBC, 1963. For complete original series production credits, see BBC, "Episode Guide", Doctor Who Classic Series (2009), www.bbc.co.uk/doctorwho/classic/episodeguide/index.shtml and IMDb, "'Doctor Who' (1963)", The Internet Movie Database (2009), www.imdb.com/title/tt0056751/.

[3] Phil Collinson, prod., *Doctor Who*, BBC, 2005. For complete new series production credits, see BBC, Doctor Who The Official Site (2009), www.bbc.co.uk/doctorwho/ and IMDb, "'Doctor Who' (2005)", The Internet Movie Database (2009), www.imdb.com/title/tt0436992/.

[4] Seasons are confusingly called 'series' in the new series of *Doctor Who*; the 2005 season is called 'Series 1', the 2006 season 'Series 2' and so on. To avoid confusion I refer to them as seasons. In the original series, serials had titles, but in the new series it is episodes which have titles. The titles I give for serials from the new series are taken from the first episode of a serial, e.g. the 2007 serial made up of the three episodes *Utopia*, *The Sound of Drums* and *Last of the Time Lords* is referred to as *Utopia*.

[5] Peter B Gregg, "England looks to the future: the cultural forum model and *Doctor Who*", *Journal of Popular Culture*, 37, 4 (2004), 648-661. IMDb, "'Doctor Who' (2005) Awards", The Internet Movie Database (2009). Retrieved 1 September 2009 at www.imdb.com/title/tt0436992/awards.

[6] John Tulloch and Manuel Alvarado, *Doctor Who: The Unfolding Text*, London: Macmillan Press, 1983. Jonathan Bignell, "The child as addressee, viewer and consumer in mid-1960s *Doctor Who*", in David Butler, ed., *Time And Relative Dissertations In Space: Critical perspectives on Doctor Who*, Manchester: Manchester University Press, 2007, 43-55.

[7] ibid.

[8] U Kalpagam, "Temporalities, history and routines of rule in colonial India", *Time & Society*, 8, 1 (1999), 141-159. David Lloyd, "Regarding Ireland in a post-colonial frame", *Cultural Studies*, 15, 1 (2001), 12-32. Eric Hirsch, "Valleys of historicity and ways of power among the Fuyuge", *Oceania*, 77, 2 (2007), 158-171.

[9] Discussed by Hazel V Carby, "Becoming modern racialized subjects: detours through our pasts to produce ourselves anew", *Cultural Studies*, 23, 4 (2009), 624-657.

[10] Alec Charles, "The ideology of anachronism: television, history and the nature of time", in David Butler, ed., *Time And Relative Dissertations In Space: Critical*

perspectives on Doctor Who, Manchester: Manchester University Press, 2007, pp.108-122.

[11] For a discussion of this discourse see Bruce Buchan and Mary Heath, "Savagery and civilization: From terra nullius to the 'tide of history'", *Ethnicities*, 6, 1 (2006), 5-26.

[12] Real world consequences of this demand are discussed by Leanne R Simpson, "Anticolonial strategies for the recovery and maintenance of indigenous knowledge", *American Indian Quarterly*, 28, 3&4 (2004), 373-384, and Lesley JF Green, "'Indigenous knowledge' and 'science': reframing the debate on knowledge diversity", *Archaeologies-Journal of the World Archaeological Congress*, 4, 1 (2008), 144-163.

[13] Andrew Fitzmaurice, "The genealogy of *Terra Nullius*", *Australian Historical Studies*, 38, 129 (2007), 1-15.

[14] "Savagery and civilization".

[15] Although the principle of *terra nullius* remains relevant, the term's etymology is widely misunderstood, so its use including in legal cases has frequently been anachronistic. "The genealogy of *Terra Nullius*".

[16] Original series serials representing humanity's present or future as multiracial, multiethnic and/or internationalist include *The Daleks' Master Plan* (1965), *The Tenth Planet* (1966), *The Moonbase* (1967), *The Wheel in Space* (1968), *The Seeds of Death* (1969), *The Mind of Evil* (1971), *The Mutants* (1972), *The Robots of Death* (1977), *Warriors of the Deep* (1984), *Resurrection of the Daleks* (1984), *The Happiness Patrol* (1988), *Battlefield* (1989) and *Survival* (1989).

[17] Excluded from the companions list are characters who only appeared in 1-2 episodes. I include Jackie with TARDIS Index File, "Jackie Tyler", Doctor Who Wiki (24 August 2009). Retrieved 1 September 2009 at tardis.wikia.com/wiki/Jackie_Tyler.

[18] Richard Stokes, prod., *Torchwood*, BBC, 2006.

[19] Tim Hunter, "Parallel universe", *The Age*, Green Guide (14 June 2007), 3.

[20] Ciar Byrne, "Doctor Who gets his first black assistant", *The Independent*, (5 July 2006), online; Adam Sherwin, "Sidekick whose time has come", *The Times*, (5 July 2006), online; Adam Sherwin, "The Doctor returns with a sassy sidekick. Who?", *The Times*, (22 March 2007), online; Richard Simpson, "Exit Billie as Doctor Who gets first black side-kick", *The Daily Mail*, (5 July 2006), online.

[21] See, for example, neadods, "Mickey, Martha, and the Message that Doesn't Belong on Who", Life on Martha (1 July 2007). Retrieved 1 September 2009 at community.livejournal.com/lifeonmartha/259659.html?thread=2812491.

[22] But see Nyder, The Evolving Guide to Lesbian/Gay/Bisexual Moments in Doctor Who (October 2006). Retrieved 1 September 2009 at www.nyder.com/stuff/whosqueer.html.

[23] Such stories include *Aliens of London*, *The Christmas Invasion* (2005), *School Reunion*, *Rise of the Cybermen*, *Fear Her*, *Army of Ghosts*, *The Runaway Bride* (2006), *Smith and Jones*, *The Lazarus Experiment*, *Blink*, *Utopia* (2007), *Partners in Crime*, *The Sontaran Stratagem*, *Turn Left* and *The Stolen Earth* (2008).

[24] *The End of the World*, *The Long Game*, *Bad Wolf* (2005), *New Earth*, *The Impossible Planet* (2006), *Gridlock*, *42*, *Utopia*, *Voyage of the Damned* (2007), *Planet of the Ood*, *The Doctor's Daughter*, *Silence in the Library*, *Midnight* and *Turn Left* (2008) all feature prominent black and Asian characters.

[25] Including the transgendered Cassandra (*The End of the World*), the married lesbian "Cassini sisters" (*Gridlock*), and a woman with a female partner (*Midnight*).

[26] Indeed, humanity *never* makes it to utopia. *Utopia* (2007) is set at the end of the universe, where humanity survives on the last cold rock and are offered a glimmer of hope in a place they call 'Utopia', which turns out to be a cruel ruse.

[27] BBC, "The Savages", Doctor Who Classic Series Photonovels (2009). Retrieved 1 September 2009 at www.bbc.co.uk/doctorwho/classic/photonovels/savages/intro.shtml.
[28] This equal opportunity casting does not extend to the casting of the Doctor himself, as Charles notes in "The ideology of anachronism", and as the recent casting of the Eleventh Doctor has borne out. Anon., "Lester explains away black Doctor Who", The First Post, (6 January 2009). Retrieved 1 September 2009 at www.thefirstpost.co.uk/people,1816,lester-laments-no-black-doctor-who,67994.
[29] Charles contends the new *Doctor Who*'s liberalism is in fact radical "in an era in which ideological absolutism is dominant". Alec Charles, "War without end?: Utopia, the family, and the post-9/11 world in Russell T. Davies's *Doctor Who*", *Science Fiction Studies*, 35, 3 (2008), 452.
[30] Chapman describes the program and the Doctor thus: "The entire series, moreover, is imbued with an unmistakably liberal ethos. The Doctor stands for the values of liberty, freedom, equality, justice and tolerance; he is implacably opposed to totalitarianism, slavery, inequality, injustice and prejudice." James Chapman, *Inside the TARDIS: The worlds of Doctor Who: A Cultural History*, London: I.B. Tauris, 2006, p. 7. See also *The Unfolding Text*.
[31] When interviewed, *Doctor Who* fans were unable to agree on the Doctor's political commitments aside from the fact that he fights baddies. Alan McKee, "Is *Doctor Who* political?", *European Journal of Cultural Studies*, 7, (2004), 201-217.
[32] *The Unfolding Text.*
[33] As Charles details: "[*Doctor Who*'s] pseudo-pluralistic conflation or assimilation of all times, places, histories and societies is at once eminently televisual, totalistic and imperialistic". "The ideology of anachronism", p. 121. For a discussion of real world links between cosmopolitanism and imperialism see Brett Bowden, *The Empire of Civilization: The Evolution of an Imperial Idea*, Chicago: The University of Chicago Press, 2009.
[34] Notoriously, the Doctor calls Hitler a "bounder" in *The Dæmons* (1971).
[35] *Remembrance of the Daleks* was a 25th anniversary story and was set in November 1963, the time of the broadcast of the first episode, *An Unearthly Child* (1963).
[36] I thank Ida Nursoo for invaluable advice on the manuscript and Rachel Morgain, Cameron Cutts and Will Grant for their clarifying insights on issues discussed in the paper.