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# Genetics, cyberspace and bioethics: why not a public engagement with ethics?

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The representation of science, medicine, and technology has been an emerging agenda item for cultural and media research in the last decade. In part, its importance arises out of a concern for the public understanding of science (PUoS), which has been a priority in governmental policy discussions. This paper discusses how the utilization of cyberspatial communities can address the challenge of developing a global engagement with science and ethics, by considering the case of genetic technology and the role of experts in public debate. It critically appraises the PUoS and suggests that a way of advancing its methodological assumptions is through developing a "Public Engagement with Ethics." On this basis, concerns about scientific journalism are more effectively contextualized and enhance the possibility of ensuring that non-experts are aware of the importance of any scientific innovation.

## 1. Introduction: science and the media

The representation of science, medicine, and technology has been an emerging agenda item for cultural and media research in the last decade (Henderson and Kitzinger, 1999; Seale, 2003; Stockdale, 1999). In part, its importance arises out of a concern for the public understanding of science (PUoS), which has been a priority in governmental policy discussions (Lord Sainsbury, 2002). How *medical* science is mediated is a critical aspect of this discourse, partly because of its important therapeutic function. Yet, various researchers have cited its reporting as a case of irreconcilable, conflicting values between scientists and the media's articulation of public concern. On this view, it is not that the media does a bad job of reporting science, as is often the criticism from scientists (Bubela and Caulfield, 2004). Neither is it representative to claim that scientists are unable to articulate their work for the non-expert, as is often the criticism of scientists from the media. Rather, the agenda of each party is different and this leads to unsatisfactory reporting and misrepresentation.

This situation is captured in Purvis Cooper and Yukimura's (2002) analysis of a scientific writers' e-mail discussion list, who find "science writers to be cognizant and concerned about the impact of their work on the public" (p. 1894), but whose capacity to reflect subtleties of scientific discoveries is limited by editorial decisions, which require

bold statements from articles. For the public, the exaggeration of scientific findings can explain the tendency for some science to lead to, what some have described as, *moral panic*, though perhaps *moral confusion* more accurately reflects the consequences of spectacular science.

While more can be said about the nuances of scientific journalism, the main priority of this paper is to consider how ethical debate can assist the development of the public understanding of science, specifically through considering gene transfer technology as the *subject* and computer-mediated communications (CMCs) as the *mechanism* for developing understanding. I wish to argue that the subject matter of human genetics and the intimate environment of CMCs offer a context where the aspiration of a PUoS can be better accomplished. Scientific journalism is integral to this conversation, to the extent that I question how emerging online communities and writings offer an opportunity to redress some of the limitations of conventional publishing, by circumventing established media gatekeepers. Moreover, the current proposal can be seen in the context of Hargreaves, Lewis and Speers (2003) who draw attention to the limitedness of merely explaining science. Their Economic and Social Research Council (ESRC) report on the relationship between science, the public, and the media, identifies the broader parameters of public under-standing in making science meaningful through connections with "policy and the broader public interest" (p. 5).[1]

My argument raises critical issues about the role of scientific information and the power structures underpinning its dissemination. Importantly, I wish to re-position the PUoS and suggest that a way forward is through developing a "Public Engagement with Ethics" (PEwE). On this basis, I argue that an ethical engagement with science alleviates many of the concerns about the limitedness of scientific journalism. This is because the moral narrative surrounding science effectively contextualizes the subject and enhances the possibility of ensuring that non-experts come to terms with the significance of scientific news. While this proposal ought not to be construed as a mechanism to make people care about science, it does claim that an ethical discourse on science can promote its relevance for a wider range of people.

Genetic science is a particularly useful case on which to study this proposal, since it reflects the difficulty (and importance) of arriving at common ethical agreements in a global, scientific culture. Human genetics has already begun to create insurmountable problems for the development of global ethical policies and the development of science. Yet there remains considerable uncertainty about what has been achieved. For example, in the past five years, the media has described the "first" cloning of human beings on five different occasions, yet still there is no actual birth of a human clone. Journalism on this issue has raised considerable concern from the scientific community and has recently been the focus of empirical research. Notably, Hornig Priest's (2001) analysis of US news production surrounding Dolly the sheep emphasizes the ethical dimensions of the science. As well, Gaskell et al. (2003) conclude their *GM Nation* report by drawing attention to the need for "public debate" on gene technology. While the study does not attempt to derive moral narratives in attitudes towards biotechnology, it does suggest that what might actually be at stake is, "not the science" (p. 19), but the moral concern about "what sort of society . . . we want" (p. 19). To this extent, my thesis develops along similar lines to that of Michael and Carter (2001), who juxtapose their own "processive" model for a PUoS against the critical and traditional (deficit) accounts. Their claims about the role of *fiction as narrative* in representing science attest to the utility of *new* media discourses, which can be developed through computer-mediated communications.[2]

## 2. Re-positioning the (ethical) expert

One of the major criticisms of the traditional view on PUoS is that it seems to describe the public as uninformed, which limits the kind of relationship scientists could have with the non-expert or public. Yet, even if one endorses the PUoS as an educative project, there are some doubts about its effectiveness. Stockdale (1999) argues that the public debate about science has never actually taken place and even claims that the successes of developing a PUoS are overstated. Indeed, Reiss and Straughan (1996) argue against the PUoS project on these grounds, suggesting that more consideration must be given to the relationship between scientists and the public. Distinctions must also be made between the various concepts integral to the PUoS, such as education, persuasion, informing, and regulation. In part, such criticisms have led to the development of "science communication," "critical PUoS," or "public engagement" as the preferred descriptors of the challenge faced by science educators and it is the last of these that I will advocate.

My critique is not specifically about the success of the PUoS or the relationship between the public and scientist, though these concerns are implied by my position. I am more concerned that the media often relies on the wrong kind of expert and that this undermines the capacity for non-experts to understand the salience of science.[3] Moreover, I am interested in considering what might be a suitable alternative model for developing public engagement with science through the media. Usually, the media utilizes scientific experts for both the explanation of science and the moral commentary that, typically, accompanies it. This is an unreasonable situation. If we are to give the notion of "expert" any value at all— and there do seem good reasons to value experts, providing the nature of the dialogue with which expertise is communicated is not authoritarian—then there is a need for expert commentary on morality and communication to clarify what is at stake for the public when new science stories break.

Yet, when considering the possibilities of an ethical debate on science, asking who should be the expert on the morality of science further complicates the relationship between scientists and non-scientists. Turner's (2001) analysis of experts provides a useful context for this discussion. Specifically, his Foucauldian claim about how expert knowledge is (mis)used reflects the implications of asking scientists for the wrong kind of expertise:

> if experts are the source of the public's knowledge, and this knowledge is not essentially superior to unaided public opinion, not genuinely expert, the "public" itself is presently not merely less competent than the experts but is more or less under the cultural or intellectual control of the experts. (p. 125)

The kind of "intellectual control" to which Turner refers is also implied by Hornig Priest (2001) and by Holliman (2004), who question the legitimacy of moral perspectives on science and identifies the tendency for moral views to become politicized and, thus, prejudiced through the media. Hornig Priest also highlights some challenges raised by framing journalism with some ethical narrative, since, she argues, it can give rise to the legitimization of "maverick perspectives" (p. 62), which are given equal worth in the name of objective reporting. Holliman (2004) extends this thesis in his analysis of UK newspaper coverage of Dolly arguing that the influence of vocal "politicians, religious figures, and scientists . . . generated the conditions for the political and ethical controversy that displaced the scientific announcement" (p. 115).

This position suggests that the use of ethics experts is similarly unhelpful (and dangerous), since it, again, places a particular kind of person in a position to control the nature of understanding. However, Turner's criticism seems related to the *manner* in which expertise is utilized and how it becomes part of the moral discourse surrounding science. Where morality is used as a *judgment* or as a way of *framing* the central issues concerning a subject, this has the capacity to limit the way that it becomes politicized. Indeed, this criticism has been made of the current US President's Council on Bioethics, specifically directed to the leadership of Leon Kass and his compatibility with the values of the Bush administration. A further level of criticism might be about the danger of bioethicists becoming shapers of moral discourses.

My position on ethical experts adopts a somewhat different account of their role in communicating science. To explain this, one can refer back to the discussion about how scientific expertise is used. It is reasonable to claim that expertise has some utility in public debates. To reject the relevance of expertise is to reject the idea that people have specialized knowledge. However, such capacity might be a specialization in argument rather than a specific subject or profession. A physician is likely to have a greater general knowledge on medicine than a mechanic. As such, the latter is better qualified to repair a car; the former a human being. Acknowledging these different kinds of knowledge need not imply more than recognizing the value of specific kinds of skills and knowledge and does not give rise to Turner's (2001) concern. Moreover, it need not imply elitism; though one can reasonably claim that some kinds of knowledge are accessible to only the few. In the present discussion, the claim is about the kinds of skills and qualities an ethicist has developed through their study. For instance, an ethicist might have a clearer understanding on the relationship between law, policy, and ethical discourses about science, than a scientist.

Thus, where the media relies on experts, it is necessary to distinguish technical or scientific from ethical expertise. Scientists are most certainly the wrong kind of expert to use for ethical commentaries on science in the same sense that ethicists are the wrong kind of experts to explain the technicalities of how science works. This does not imply that only certain kinds of people can acquire ethical expertise. Indeed, it argues the contrary and, moreover, acknowledges that a preferable situation might rely on developing expertise in both the technical and moral aspects of science. Indeed, this suggestion reflects Hoggart's (2004) appeal to higher education programs in the UK to foster social and philosophical tuition in scientific undergraduate programs. It also responds to Ziman's (1998) identification of a need for greater ethical sensitivity among scientists. Alternatively, it might entail opening up academic conferences to the broader public, thus widening the range of delegates who attend scientific congresses or even considering media strategies related to scientific meetings.[4] The ethicist should not be seen as a moral judge of science. To entertain this prospect would be inherently troubling and has led to a range of criticisms made about (bio)ethicists, some of which have been mentioned earlier. It would also fail to acknowledge the dangers of the "celebrity bioethicist" (Turner, 2004), who either finds their ethical views utilized to endorse the practices of corporations, or celebrates their ethical insights with the extensive fees they receive for their consultancy and alleged wisdom. These are each troubling prospects for developing a greater role for ethical experts as part of public engagement.

However, I argue that the ethicist's role in the communication of science must be somewhat pedagogic, rather than expressive. The kind of ethical expertise I propose calls upon ethicists to reconsider the media encounter as an opportunity to explain the range of moral concerns about a given case, rather than a chance to assert personally held beliefs

about a subject. To this extent, the argument takes into account the criticisms of Turner (2004) and Miles (2004) with whom I share the frustration over the "soundbite" interview, which I have criticized elsewhere (Miah, 2004). As Miles (2004) argues "As in any teaching activity, a medical ethicist should know what he or she wants to teach before the reporter asks a question and should stick to that message rather than being drawn into a docu-soap's prefabricated story line" (p. 42). I am doubtful that many ethicists approach media attention as an opportunity to explain or teach the broad range of ethical issues arising from any given subject. More likely, they utilize the opportunity as a way of asserting their particular point of view on a subject. This might also reflect the novelty of media encounters within philosophy and ethics.

In sum, calling for a greater role of ethics and ethicists in the PUoS is twofold. First, I argue that the communication of science must be more closely allied to engaging the public with the ethics of science. Second, I argue that this should be accompanied by a reconsideration of how ethical commentaries are used in scientific journalism. This view need not entail elevating ethicists to some greater social status (even though law often relies on such a system). Indeed, I share Hornig Priest's (2001) concern about the use of ethical viewpoints in the media. I also support the criticisms of relying on ethics experts as a basis for setting public policy on science. Yet, there is still some merit in arguing that an academic (ethicist) occupies a special place in society, free from conflicts of interest, which might limit their views on how people should live (Halwani, 2002; Nussbaum, 2002). Indeed, Turner's (2004) argument is relevant precisely because it acknowledges the importance of impartiality in ethical debate. These ideas find support from the claims made by Parsi and Geraghty (2004) that the public intellectual has all but disappeared from social discourses and that this is unfortunate. Their paper speaks specifically about the role of bioethicists and draws a distinction between the "public intellectuals" and "academic experts," the latter of which are inextricable from the concerns about how academics are utilized through the media.

Without making a distinction between different kinds of knowledge, the non-expert or public relies on the moralizing of an individual scientist, whose personal circumstances or beliefs might limit the kind of ethical discourse that is presented through the science. Moreover, the use of scientists as moral experts, as Hornig Priest argues, often misleads non-experts by equating the moral view with scientific opinion—as a matter of fact rather than judgment. My thesis calls more broadly for a development of a "Public Engagement with Ethics" (PEwE), both through considering how ethical engagement is theorized, but also how it is communicated through scientific journalism.

A considerable difficulty with this proposal is the lack of willingness of ethicists to embrace media coverage of their perspectives. There is sometimes considerable resistance from both scientists and ethicists to their participation in media discourses, since the nuances of science and morality are often simplified by the limitations of journalism. In response, Simonson (2002) argues that "popular media helps to constitute bioethics" (p. 32) and that "grumbling about media is a form of symbolic distancing that helps define scholarly bioethics as a field" (p. 33). While Simonson recognizes the importance of developing links with journalists, it is his suggestion of a "conversation" on the ethics of science and medicine that intrigues me and most suitably describes the context for this paper. Following the work of Albert Jonsen (1998), Simonson criticizes the "commercialised spectacle" of mass media and calls for a more "intimate" engagement with ethics. Simonson's (2002) argument gives rise to a rationale for utilizing computer-mediated communications as a way of developing "intimacy" and for considering what a PEwE would entail.

## 3. Cyberspace, power and genetics

The suitability of cyberspace as a means of promoting ethical dialogue must be seen in the context of cybercultural theory or web studies, where such prospects have been informed by critical appraisals of what actually takes place online. The earlier claims that cyberspace would liberate marginal groups (Rheingold, 1991; Turkle, 1995) have now been tempered by the realization that cyberspace is no panacea for society. While critics of the Internet identify the lack of evidence to support the claim that it is a more effective mechanism through which to free people from social constraints than non-virtual reality, there is considerable evidence that it offers a kind of leisure space where people experience some extended sense of intimacy or agency. Early theoretical work on the ontology of cyberspace draws attention to its capacity to develop shared, close, and intimate communities. As Markham (1998) describes, "even in purely text-based online contexts, people establish and maintain intimate friendships, romantic relationships and stable communities" (p. 17). Clayton (1997) offers further support for this, claiming that "virtual communities can return us to personal interaction, a culture of intimacy in which the individual can communicate with anyone."

In the context of science, it can be suggested that the Internet has been increasingly *medicalized* and that this has led to the creation of pseudo-scientific communities. The World Wide Web is celebrated as a means of providing greater opportunities for the public to engage with medicine (Craigie et al., 2002) and to understand the nature of illness. This is reflected in studies that indicate the way in which support is developed through sharing information and experiences of illness through chat-based online environments (Burrows et al., 2000). The opening of "cyber-pharmacies" (Oliver, 2000; Scaria, 2003), WebMD, and telemedicine, more broadly, make possible the opportunity for non-medics to become more aware of their conditions and to find others who can provide information for them. In short, it allows access to a range of discourses that have otherwise been impenetrable. As some indication of this shift, the emergence of online journalism and blogs (web-logs) displaces the institutional, commercial, and structural boundaries of scientific journalism. However, it would be mistaken to characterize them as apolitical. Rather, as Atton (2004) argues, "what appears as bias and the absence of balance in the alternative media is to be considered not as a set of absolute truths; instead it comprises a set of accounts told from different perspectives" (p. 39). Thus, the Internet provides a mechanism for anybody to write about science and for collective understanding to emerge.[5]

One might argue that this emergence of new, expert voices has come at a price, where information about such drugs as Viagra bombards our e-mail in-boxes, boasting their capacity to improve our health and, perhaps more critically, our lifestyles (Mamo and Fishman, 2001). The lack of regulation of such sites has the potential of translating into a greater lack of understanding about health and medicine, rather than offering a greater opportunity to inform people (Burgermeister, 2004). For example, the way that the Internet is offering access to medical information has created a number of alarming communities, such as the Pro-Ana (pro-anorexia) (Ferreday, 2003) sites and the so-called suicide chatrooms (Rajagopal, 2004). The possibility for mis-information to gain credibility is also demonstrated by the Ron's Angels web-based company (www.ronsangels.com), which purported to sell female ova and male sperm, though seems to have turned into a promotional tool for Ron Harris' pornographic movie industry. Similarly, there remains some uncertainty about the level of comfort that online encounters can provide. The potential for "flaming" or misunderstanding seems considerable with CMCs and harassment can lead to considerably disempowering consequences (Burrows et al., 2000). This chal-

lenge has been addressed in a variety of contexts, particularly those concerned with the provision of health care. The inter-disciplinary nature of how information is appropriated has not yet gained much academic attention. Yet, some researchers have argued that the risk involved with "sharing intimate feelings and embarrassing problems is minimised" through CMCs (Hardey, 2001: 393). Moreover, information management concerns and opportunities are only part of the problem with utilizing the Internet for moral conversation and there are no studies yet of moral discourses and science awareness to inform our debate.

A further concern about the Internet is that it has the potential to homogenize people or, at least, to blur the distinctions between cultures and values. One clear way that this effect has been articulated is through the dominance of the English language on the Internet, which itself is a product of the historical development of protocols, programming languages, and telecommunications more broadly. In relation to the ethics of human genetics, homogeniza- tion might be seen as positive, since it might be interpreted as a convergence of values. Particularly in the context of global ethical issues, this convergence could facilitate international agreements more effectively and a greater understanding of cultural differ- ences. In this context, the example of human cloning is, again, useful to draw upon. Just recently, the United Nations approved a prohibition on human cloning (United Nations, 2004) after some months of delay and abstention (United Nations, 2005). While not legally binding, for some nations this is unfortunate, since the decision is characterized by the political weight of a majority who have been misinformed about the science. For others it is a relief, since there are insurmountable moral issues arising from human cloning.

This case is particularly interesting, since it relies significantly on cooperation and shared policies on the use of medical science. The acceptance of human cloning in one country has implications for the rest of humanity. While, this is not so different from how other technologies have a global impact, its perceived direct impact on the human gene pool would seem to have yielded some special status to this science. The significance of genetics as a global problem rather than a domestic one is recognized through UNESCO's (1997) declaration on the human genome and human rights. This makes it all the more interesting, since it assumes close ties to another context where a universal ethics is sought: human rights.

The UNESCO declaration makes explicit how human genetics can give rise to considerable challenges to individual liberties, norms, and laws that directly affect people's lives. This global character to genetics raises a question about whether a universal ethical policy is possible (or even desirable) in relation to science, which has always been poised uncomfortably between public and economic interest. Yet, one might also argue that the homogenization of ethical views would be undesirable. Rather, the end goal of ethical debate is sometimes to preserve variance of values and traditions and to maintain the right to hold such beliefs. Nevertheless, if we look further into the United Nation's work and consider its Universal Declaration on Human Rights (1948), as the best example of a globally accepted implementation of ethical principles, then one might argue that some form of universal ethics is possible and worthwhile to pursue. UNESCO's declaration on the human genome is a further attempt to think through probable concerns arising from the global impact of science. While this is not the place to inquire further into the possibility (and value) of making moral values universal, the difficulties implied by developing moral convergence on science are important to address.[6]

The Internet can play a critical role in creating a space where values can be shared, thus offering a new opportunity to re-engage the public with science, rather than to patronizingly call for their understanding. For example, LaFollette (1993) offers further support for this proposal by drawing attention to the importance of intimacy in moral discourses.[7] Moreover,

Triunfol and Hines (2004) discuss how the Internet has been used to promote debate about genetically modified foods. Similarly, in a study of patients with cancer, Ziebland (2004) indicates that use of the Internet even responds to the "experts" debate, by promoting a greater sense of agency and knowledge in patients and, thus, collapsing the distinctions between expert and non-expert.[8]

## 4. The public engagement with ethics

Critical PUoS acknowledges that the mediation of science, as a process of achieving public understanding, is fundamentally flawed. It unreasonably conceives of the public as having to be informed by the scientific community, thus placing the public in a subservient position, a position of deficit. MacIntyre (1995) criticizes this approach very early in its development, arguing that it misrepresents the relative positions and knowledge of scientists and the public. As one can argue that there is more than one kind of public, there is also more than one kind of scientist.

I wish to advance the proposals of public engagement by suggesting that it is engagement with ethics that would more effectively develop an understanding of science. Despite the vast amount of literature concerned with the PUoS, very little of it makes explicit the ethical or moral implications of medical science and technology. When discussing the nature of "understanding" there has been no attempt to extrapolate what kind of understanding is desirable: whether it is for the technical aspects of the information—how things work—or whether it is for the implications of the research—what things means. While one could argue that the rationale for developing understanding has always been to allay groundless fears, to build trust in the scientific process and to connect this process with the broader aspirations of society, the ends of science, or the *value* of scientific progress in general are rarely discussed. This is perhaps not surprising, since the development of the PUoS has emerged from the social sciences. In contrast, the kind of inquiry that would question the basis of such knowledge is more philosophical and would question the meaning of knowledge and discuss competing views about the importance of knowledge.

Yet, one has only to pick up any piece of scientific journalism to appreciate that the salient aspects of science, technology, and medicine have less to do with the technical details, than with the ethical, social, moral, and political implications of that technology. The public(s) are concerned primarily for what science "means," rather than for how it "works." When examining the literature on PUoS, it is clear that a number of moral concepts are implicit of this project. "Understanding" is assumed to imply an understanding of the moral issues. However, studies do not specifically address the non-expert's capacity to understand what kind of knowledge ethics entails. To develop such skills would require a very different kind of inquiry and, perhaps, would not be strictly about science or technology. The public understanding of ethical issues is clearly a critical issue in other sorts of current affairs, such as international terrorism or health-care priorities. For many of these topics, particularly science, the crucial aspect of understanding is the ethical context. As I have suggested, a good example can be found in relation to the announcement of the Human Genome Project (HGP), which is, for many people, a largely abstract development in science, for which the implications are not obvious. The only way in which the HGP is made meaningful is in relation to how it might change humanity ideologically, rather than technically.

There is some evidence to suggest that these proposals can be harnessed to develop a public engagement with science through ethics. Barns et al. (2000) describe a study where human genetics provides a backdrop to an evolved "communal moral reasoning" through

group discussions. Additionally, Etorre (1999) provides a useful support for the problematization of experts within the context of genetics. Through an empirical analysis of experts as story-tellers, Etorre identifies the role of an ethical narrative within expert statements. Etorre even argues that "in order to be sustained as a viable scientific discourse, reproductive genetics is aided by the moral mediation of experts" (p. 553).

## 5. Conclusion: "wacky science" and ethical engagement

> We are never going to be rid of Frankenstein, even if we want to be. (Turney, 1998: 220)

Interestingly, my proposal has challenging implications for the earlier criticisms of scientific journalism. Thus, while some critics of media representations of science have argued for less "wacky science" (Hargreaves et al., 2003: 49) in news reporting, there is merit in thinking through the ethics of science by considering "wacky" prospects. An important way in which the ethical implications are made meaningful in various cultural texts (film, television, literature, news) is through the use of metaphor or the analogizing of science fiction to science fact (Brem and Anijar, 2003). As Christidou, Dimopoulos and Koulaidis' (2004) study of metaphor in scientific journalism indicates, "social representations evoked by the use of metaphors about science and technology in the press and popular scientific magazines contribute to the upheaval of the cultural authority of the corresponding field, hence playing a significant role in the maintenance of the social autonomy and integrity of the techno-scientific profession" (p. 359). As well, critical to scientific journalism have been its linguistic aspects. Condit (1999) and Liakopoulos (2002) note how the use of metaphor has been essential to discourses on genetic technology, with such terms as "blueprint," "book of life," "Pandora's box," "Frankenstein," and "playing God" all appearing as key descriptors about what is implied by the development of new genetic technology.

Thus, scientific communication relies on the use of metaphor to create meaning, though this is often criticized—particularly by philosophers, bioethicists and scientists. For example, when discussing genetic technology, people often imagine this technology as "playing God," without giving much consideration of the content of that metaphor. Yet, very little has been discussed about how mediatized scientific metaphors inform the understanding of ethics (Liakopoulos, 2002; Condit, 1999). This is an oversight in the literature, particularly since the use of metaphor is crucial to science, which itself relies on metaphor as part of its theoretical and conceptual landscape (Pickering, 1999). In part, it is understandable that these metaphors often incite frustration for scientists about how their work is communicated. After all, part of the problem with the lack of inquiry into the use of metaphor within public discussions about science—which is highlighted by re-framing the PUoS as the PEwE—has to do with wondering what kinds of metaphors are appropriate to use. Is the use of gene transfer technology really like "playing God"? Is the human genome really the "book of life"?

Being able to answer these sorts of questions could help develop a more effective engagement with the salient aspects of science. It is not necessary for the non-expert to understand the specifics of particle physics or molecular biology. It is not particularly important that people understand that DNA looks something like a twisted double helix. Indeed, most scientists do not really have an in-depth knowledge of anything beyond their specialization, so the aspirations for public understanding must be capped somewhere. This cap should be on being able to make sense of these innovations in the context of a broad

range of social values and priorities, or what might more typically be described as an understanding of social justice.

Through developing a Public Engagement with Ethics, further work must be done to develop new ways of conceptualizing and communicating science and medicine. The use of metaphor is a rich way of making science meaningful, yet we rely too much on metaphors from past eras, such as the frequently cited "Frankenstein" myth, which continues to overwhelm the public consciousness on genetics (Turney, 1998). Criticisms are often made about such examples, since they simplify the implications of science significantly. Yet, it is these texts that inform the non-expert's understanding of science and they constitute imaginative articulations of how the future might develop if such technology is accepted. However, new analogies and new metaphors are needed and the media (and literature) must play a crucial role in this development. There is a need to move towards a public "engagement" with ethics, which can be achieved through developing a PEwE.

When considering this in the context of other media forms, Petersen (2002) identifies that print journalism fails to engage with the finer details of moral debate. For example, when considering the press coverage surrounding the birth of Dolly the sheep, Petersen notes that: "Those news stories that drew attention to threats to 'identity', 'individuality' or 'human dignity', or to the 'moral unacceptability' of human cloning, offered little or no analysis of 'what it means to be human' or what exactly was morally objectionable about human cloning" (p. 86). By utilizing computer-mediated communications and promoting informed dialogue, it is possible to circumvent the criticisms of "expert" discourses in science and technology. Furthermore, this proposal takes into account recommendations from the UK's Wellcome Trust and recent discussions within bioethics, which call for the integration of social science and ethical inquiry (Haimes, 2002; Hedgecoe, 2004).

These proposals imply the need to reconsider public engagement/understanding strategies by integrating ethical development as part of the educational/communicative model. This might entail the formal introduction of moral reasoning skills as part of a national curriculum, or could even emerge out of principles developed through philosophical counseling. Yet, it is also worthwhile considering the less-formal mechanisms that can offer opportunities to create ethical engagement with science, perhaps through the programming of science festivals, which can encompass the broader community of cultural industries in the processing of science.

## Acknowledgement

## Notes

1  It is also useful to consider the recommendations of the earlier ESRC report, which call for the need to "research into the impact upon science communication of the Internet and other 'new media'" (Hargreaves and Ferguson, 2000).
2  Important overlaps between fiction, narrative, and bioethics are also important to this paper. In particular, Chambers' (1996) work argues that the way in which the story is told through narrative and metaphor plays a crucial role in its evaluation.
3  Hargreaves et al. (2003) also conclude that the current model for utilizing scientific experts in the media does not increase the public understanding of science, which further calls for alternative models and proposals.
4  An example of this is the Citizens' Conference on Advances in Human Biology in the Genomics Era, Montréal Science Centre (5–6 February 2005), initiated by the Groupe de recherche en bioéthique de l'Université de Montréal (see http://www.centredessciencesdemontreal.com/fr/activites/activites_evenement_genomique.htm).

5  Again, my emphasis here aims to alleviate Turner's (2004) concern about the celebrity bioethicists, by emphasizing the importance of less-established media spaces as a place to discuss ethics in science.

6  On this matter, it would be useful to read recent discussions on Habermas' reappraisal of human rights, where he articulates its role as a political ethical reaction, rather than a universally justifiable moral code (Abdel-Nour, 2004; Habermas, 2001a, 2001b).

7  Utilizing the Internet as a way of developing intimacy can also alleviate the burden posed by Giddens' (1991/1996) description of the "pure relationship."

8  One might also consider this to imply a heavy responsibility, which itself might be ethically suspect, when the responsibility is borne by people who are unwell.

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