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1 How (not) to talk about technology

International Relations and the question of agency

Matthias Leese & Marijn Hoijtink

In recent years, advances in both physical (i.e. engineering and robotics) and digital (i.e. artificial intelligence and machine learning) aspects of technology have led to the development of powerful new technologies such as so-called Autonomous Weapons Systems (AWS), algorithmic software tools for counterterrorism and security, or “smart” CCTV surveillance. These and other technologies have potentially profound repercussions for the ways in which action in international politics becomes possible, the ways in which relations between states become structured, and the ways in which wars are fought, security is produced, and peace is made and maintained. Accordingly, algorithmic and robotic technologies¹ have received much attention from the discipline of International Relations (IR), but also from the policy-making world, the media, and the public. Debates thereby predominantly revolve around the claim that such technologies could to a large extent act autonomously, i.e. without human input when it comes to tasks like identifying and engaging military targets, searching for indicators of terrorist activity within large datasets, or analyzing live video footage for deviant behavior. This means that technologies are ascribed the general capacity to act and to create an impact in the world. In other words, they are believed to have *agency* that is predicated upon the ability to collect information about the world through sensors or data input, and to interact with the world on the basis of this information.

Such an assumption would run counter to the modernist presupposition that agency (defined by the *Oxford Dictionary* as “action or intervention producing a particular effect”) could be exclusively found in humans, as humans would be the only species capable of reflexive thinking capacities, and therefore self-consciousness and free will. From this perspective, ascribing agency to technologies (or other non-human elements) creates a set of quite fundamental problems: if – staying within the above examples – machines would make decisions about what to define as a legitimate military target, who should be considered a potential terrorist, or what kind of behavior would warrant interventions by state authorities, then who could and should be morally, legally, politically, or economically held accountable and responsible for these decisions and their consequences? In turn, these

and similar considerations have direct implications for international politics. Should AWS, for example, be preventively banned or integrated into existing non-proliferation regimes? How are international security practices informed and structured by global data collection programs and algorithmic number-crunching? And what kind of public order is being engendered by behavioral analysis in CCTV systems, possibly combined with other features such as automated face recognition software? Presupposed machine agency in the sense of autonomous action would seriously challenge the status of (international) politics as a domain of human activity.

A closer look at how technologies “act” however usually reveals that they do not do so in an autonomous fashion, after all. Military drones are operated and supervised by a whole team of human staff on the ground. Counterterrorism software tools need to be developed, implemented, maintained, and fed with data on a daily basis by human analysts. And alerts produced by surveillance systems still need to be validated and acted upon by human security officers. This means that most technologies are, in fact, rather working *with* humans than in the place of humans. They assist, pre-structure, point out and make suggestions. They do the “heavy lifting,” take care of both complex and challenging tasks as well as dull and monotonous ones, and sometimes they “extend” human cognition by giving us access to additional information that we cannot sense ourselves. But in the end, humans and technologies enable each other in order to create an impact in the world. Technologies should therefore, in the sense of the workload distribution that characterizes them, best be conceptualized as “socio-technical systems” (Law, 1991) that are comprised of heterogeneous human and non-human elements.

Such an understanding of technology – while acknowledging complexity and context sensitivity of (political) action – does, however, not resolve the question of agency in relation to algorithmic and robotic technologies. Clearly, when machines or computer systems do things that their human operators cannot do (or do not want to do), they play a role in how action is constituted and how meaning is produced. Hence, there is a need to study the ways in which technologies have, and exercise, agency. Technologies are political agents – not in a liberal sense that would presuppose that they act as conscious subjects whose actions are predicated upon volition and free will, but in the sense that they have effects on political action. This may seem a banal claim. Yet, we find that in the discipline of IR two broader tendencies have long prevented such a conceptualization of technology within international politics.

The first tendency is the predominantly determinist reading of technology throughout the history of IR. From classic works such as Ogburn’s *Technology and International Relations* (1949b) or Skolnikoff’s *Science, Technology, and American Foreign Policy* (1967) to more recent contributions, most analyses are in fact predicated upon the assumption that technology is either fully controlled by humans or alternatively placed outside of human agency (McCarthy, 2013, 2018). While neatly fitting in with a prevailing scientific

understanding of analysis (i.e. causal and mechanistic) throughout mainstream IR (Jackson, 2017), such a treatment of technology does however not sit well vis-à-vis algorithmic and robotic technologies and the acknowledgment of complexity and human-machine interactions within socio-technical systems. In order to overcome the externalization of technology as an explanatory variable in IR and to render it “endogeneous” to international politics, a number of scholars have thus suggested to unpack technology by foregrounding its construction, implementation, and use. Such a holistic approach would then enable us to account for the politics that go into technology, as well as for the politics that emanate from technology (e.g., Herrera, 2003; Fritsch, 2011).²

The second tendency that has prevented a stronger analytical appreciation of technology in international politics is the conceptualization of agency within IR. IR scholars have long been concerned with the “agent-structure problem” (Wendt, 1987), i.e. the question of whether human action should be seen as the decisive element for the analysis of international politics, or whether human action would always already be pre-defined and constrained by the social structures in which it is embedded. In an attempt to overcome this duality of agency and structure, Jackson and Nexon (1999) have proposed to turn to a relational analysis of action that, rather than asking what international actors do, foregrounds who these actors are and how their agency is produced. This relationalist turn has paved the way for a re-appreciation of (political) agency as emergent and dynamic rather than static and pre-determined. Moreover, it allows us to move away from an understanding of agency as an attribute (that would need to be located within someone or something) and towards an understanding of agency as a product of interaction. In other words: agency does not precede action, but action constitutes agency. Most importantly, however, it speaks to the acknowledgment that agency must not necessarily be exclusive to humans enables us to account for technology and its politicality through the study of interaction within socio-technical systems.

The aim of this book – based on the premises to (1) unpack technologies in order to render them political, and (2) to understand agency as something that is produced through interaction – is to ask how technologies (co-)produce, alter, transform, and distribute agency within international politics. Working through the notion of agency and its transformations against the backdrop of algorithmic and robotic technologies thereby allows us to reconsider the ways in which technology has been treated in IR. A focus on agency moreover serves as a common denominator for the variegated theoretical and conceptual approaches that scholars in IR have more recently taken up to study technology, including the likes of “Social Construction of Technology” (SCOT, Bijker et al., 1987), “Actor-Network Theory” (ANT, Callon, 1984; Latour, 2005), “co-production” (Jasanoff, 2004), “performativity” (Butler, 2010), “vibrancy” (Bennett, 2010), “mangle” (Pickering, 1993), “intra-action” (Barad, 2007), “configuration” (Suchman, 2007), or post-human approaches (Cudworth and Hobden, 2013).

The contributions to the book provide in-depth explorations of the entangled and multi-layered ways in which humans and technologies interact, work together, and mutually empower and/or constrain each other. In this vein they offer a variety of theoretical and empirical accounts of *Technology and Agency in International Relations*, including questions of theory-building and empirical analysis that emanate from Jasanoff's notion of "co-construction" (Jacobsen and Monsees), the boundary work between humans and non-humans in military weapons systems (Leese), the mediation of security governance through the production and analysis of satellite imagery (Olbrich), the effects of practices of drone warfare on how military operators perceive the world (Edney-Browne), the role of blockchain technology for international financial regulation (Campbell-Verduyn), the design of algorithms for crime forecasting and intelligence (Kaufmann), and the emergence of large IT infrastructure systems for border management (Glouftios). The book concludes with an interview with Claudia Aradau, who discusses technology and agency in relation to her own work on materiality, Big Data and algorithmic security, and explores a number of questions concerning politics, ethics, and methodology vis-à-vis the discipline of IR.

This introduction proceeds in three steps. First, we briefly revisit IR's grand theoretical debates (i.e. realism, liberalism, and constructivism) and pay specific attention to the ways in which technology within these frameworks has been treated in a deterministic and externalized fashion. Subsequently, we discuss the agency-structure debate and the turn towards relational analyses. We then explore more recent influences from STS and New Materialism into IR, and analyze how these approaches help us to study technology and agency in international politics.

Technology in IR: determinism and externalization

IR's answers to "the question concerning technology," to borrow from Heidegger's (1977) seminal essay, have come with quite a degree of variance, depending on assumptions about the essence of the international system, the possibilities and conditions for change or stability, and the general relationship between technology, politics, and society. As Ogburn (1949a: 18) has argued as early as in 1949, "in international relations the variables often stressed are leaders, personalities, social movements, and organizations. These are important variables in explaining particular actions and specific achievements. But because of their significance the variations of technological factors should not be obscured." In *Technology and International Relations* – an early attempt to create a systematized account of the role of technology in global affairs – Ogburn (1949a: 16) illustrates the presumed causal influence of technological tools on world politics as follows:

Few doubt that the early acquisition of steam power by the British before other states acquired it helped them to become the leading world

power of the nineteenth century and thereby made the task of British diplomacy much easier. Britain's steel mills, with their products for peace and for war, enabled her to spread much more effectively the ways of European civilization into Africa and southern and southeastern Asia.

Ogburn's account notably set the tone for ensuing realist engagements with technology – and particularly military technology – as a capabilities-enhancing variable that provides states with a power edge vis-à-vis other states in the international arena. As for realist and neorealist IR scholars, the international system is characterized by an anarchic structure that produces fierce competition between rivaling nation-states (Morgenthau, 1948; Waltz, 1979), the absence of rules (and/or their enforceability), the will to survive, and the lack of certainty about the intentions of other states (Mearsheimer, 1994). As the hierarchy within the international system is determined by the power capacities of states, the question of power and its acquisition is central. Power is in this sense usually conceptualized in terms of military and economic capacities. Technology is within realist and neorealist accounts of international politics then mainly treated as a tool that enhances state power, for instance through upgrades of military equipment (e.g., longer missile range, higher firing rates, more protective armor), or improved efficiency of economic means of production.

In the realist paradigm, technology has the capacity to become a game changer within the international system and its study has been put center stage by many during the Cold War period. Against the backdrop of technological competition between the West and the East (e.g., the arms race, the space race), the (sub-)discipline of Strategic Studies primarily evolved around the study of the influence of military technologies on power distribution within global politics. As Buzan (1987: 6) argues, “the subject matter of Strategic Studies arises from two fundamental variables affecting the international system: its political structure, and the nature of the prevailing technologies available to the political actors within it.” Whereas questions of the political structure of the international sphere were considered a task for traditional IR, the technological component of international security had to be, according to Buzan (1987: 8), discussed by scholars of Strategic Studies focusing on the “variable of military technology.” Independent of whether one considers the study of technology to be a unique feature of the dedicated (sub-)field of Security Studies, or alternatively as a core concern of IR, the distinction made by Buzan indicates that the political structure of the international system is itself not affected by the availability of technology – an argument that, thus, treats technology as an externalized explanatory variable for change/stability in the international system.

This does, of course, not mean that technology would not be seen as important for international politics. For realists, the political structure influences the

development and implementation of technology, and technology, in turn, is widely regarded as a factor determining the military capacities of states and their strategic options in an international system that is characterized by anarchy. During the Cold War period, large parts of the IR literature were in fact dominated by questions about military capacity and the control thereof, with a particular focus on nuclear technology and the implications of the availability of the atomic bomb as an unprecedented means of mass destruction. After the end of the Cold War, the focus of analysis – following new military strategies vis-à-vis newly available technologies – shifted increasingly towards the incorporation of information and communication technologies (ICTs) into military equipment in order to enhance warfighting capacities of the US military. This so-called Revolution in Military Affairs (RMA) corresponded closely with more risk-averse political strategies of Western states that sought to avoid military fatalities, as well as a turn towards more specialized high-tech troops that would be able to conduct combat with precision and efficiency (Shaw, 2005). Within concepts of RMA, information is regarded as the key component that creates an advantage on the battlefield, as it enables better situational awareness and enhanced decision-making – both in combat and in military planning (Gray, 2005).

While a (neo-)realist research agenda on technology is still very much focused on questions of how technological advancements alter military capacities and therefore potentially bring about changes in international politics that are predicated upon state power, the increased interest in ICTs bears an interesting parallel to liberal IR approaches to technology. Starting from a rather different analytical point of departure, liberal scholars posit that the international system undergoes a continuing transformation into a networked, interconnected, and interdependent global structure that is decisively distinct from the anarchic assumptions of the realist tradition (Rosenau, 1990). Within such processes of transformation, technology is conceptualized as a major driver that connects actors at multiple levels. As liberal scholars argue, the time-space compression of globalization has to a large extent been enabled and accelerated by ICTs and mobility and transportation technologies. These technologies, so the argument goes, have elevated cultural and economic exchange between societies to an unprecedented level and have thereby strengthened cultural ties on a global scale (Rosenau and Singh, 2002). Rosenau (1990: 7) describes the “postinternational politics” of a globalized world as

[S]horthand for the changes wrought by global turbulence; for an ever more dynamic interdependence in which labor is increasingly specialized and the number of collective actors thereby proliferates; for the centralizing and decentralizing tendencies that are altering the identity and number of actors on the world stage; for the shifting orientations that are transforming authority relations among the actors; and for the

dynamics of structural bifurcation that are fostering new arrangements through which the diverse actors pursue their goals.

Whereas most liberal scholars share a general optimism about the possibilities of an interconnected world for the spread of common norms and values and the general conditions for peace, others have also pointed to the risks emanating from global connectivity. For example, Der Derian (2003) foregrounds how information technology has empowered non-state and non-Western actors, but has at the same time contributed to the professionalization of transnational organized crime and terrorism.

In his work on the rise of the network society, Castells (2000) goes as far as to claim that the structure of the international system has turned away from one in which states are the dominant actors, towards one that is founded on flows and networks instead of static and sedimented institutions. In a globalized and interdependent world, international organizations, NGOs, or multi-national corporations should be recognized as relevant actors on a global scale, as their role in the regulation of global issues bears witness of novel and complex structures at the international level. For Fukuyama (1992), in such a world, the increasing availability of technological means for military purposes and the ensuing potential for destruction such military technologies have would lead to a redistribution of power in the sense that differences between actors would be leveled and the international system would become geared towards more cooperation rather than conflict.

As technology plays a considerable part in liberal IR theory as the driver of systemic change, liberalism can be viewed as a helpful attempt to theorize the status of technology through phenomena such as interdependence, cooperation, and transnationalism. However, it should be kept in mind that technology is only one among multiple factors that engender such developments. Political programs, social change, and cultural influences are regarded to be just as transformative as the influences of new technologies when it comes to processes of globalization. For Rosenau, for instance, education and politicization of the population is key when it comes to changes in world politics. As he argues,

although world politics would not be on a new course today if the micro-electronic and other technological revolutions had not occurred, if the new interdependence issues had not arisen, if states and governments had not become weaker, and if subgroupism had not mushroomed, none of these dynamics would have produced parametric change if adults in every country and in all walks of life had remained essentially unskilled and detached with respect to global affairs.

(Rosenau, 1990: 13)

Finally, a different approach to technology in world politics is put forward by constructivist positions. As constructivism, generally speaking, presupposes

that the world is “made” by human beings (Onuf, 1989), constructivist IR scholars suggest that material aspects within international politics do matter, but that they only acquire meaning in relation to social norms and identities (e.g., Wendt, 1992; Katzenstein, 1996). This claim is grounded in the assumption that international politics are embedded in a structure that is fundamentally social, and that this structure in turn influences the identities of global actors. For Wendt (1995), the social structure that underpins international politics is characterized by shared knowledge, material resources, as well as practices. His conception of politics presumes that technologies do matter, but – similar to Rosenau’s reservations – only in conjunction with larger social and societal trajectories. As Wendt (1995: 73) argues, “material resources only acquire meaning for human action through the structure of shared knowledge in which they are embedded.” In other words, technology can be an influential factor within the international system (Adler, 1997), but its impact cannot be understood without the social layers within which it is embedded. And while there is a general possibility for systemic change, such change is crucially not brought about by the invention or implementation of new technologies, but by changing norms and values. As Wendt (1995: 81) puts it, “to analyze the social construction of international politics is to analyze how processes of interaction produce and reproduce the social structures – cooperative or conflictual – that shape actors’ identities and interests and the significance of their material contexts.”

This brief summary of mainstream IR theories and their stance toward technology, although certainly not doing enough justice to decades of debates and theory-building, illustrates how technology, against the backdrop of the discipline’s defining question (i.e. change and stability within the international system), has predominantly been conceptualized as an external variable that exerts influence on international politics, but that is in itself little political. In other words, IR scholars were for the most part interested in technology as a tool that has the capacities to amplify power, foster processes of globalization, or play a role in the emergence of norms and identities. IR has, however, shown surprisingly little interest in *unpacking* technology – that is in investigating how technologies are being constructed or how they become implemented and used in specific institutional or organizational contexts. In a lifecycle of technology that covers different stages from basic and applied research; engineering and design; implementation, practice, and maintenance; to eventual “death” or replacement, IR was thus first and foremost interested in how already available and implemented technologies interfere with politics and society (Fritsch, 2011).

McCarthy (2013, 2018) attributes this externalization to a predominant determinist understanding of technology that can be encountered throughout most of IR, either in instrumentalist or essentialist terms. An instrumentalist understanding of technology presupposes that technology is a neutral tool that only acquires meaning through its use and resulting social and political practices. The assumption here is that technology could be

fully controlled by humans and could thus serve as a means to pre-specified ends. In IR, this idea can be encountered most clearly in realist accounts that see (military) technology as a means to enhance the capacities to wage war, and therefore to gain power vis-à-vis other states. An instrumentalist understanding of technology thereby results, as demonstrated, in the inevitable externalization of technology as a variable that influences the international system, but is itself not an integral part of that system.

Essentialism, on the other hand, conceptualizes technology as a central driving force for progress. Essentialist variants of determinism are underpinned by a strong belief in teleological progress, and by the idea that social and economic constraints can be overcome by technological innovation. Dahlberg (1973), for example, identifies a “technological ethic” that is deeply embedded within Western values and politics, and that is characterized by scientific rationalization, an exploitative control of nature, the search for perfection, an increasing functional specialization, and novel forms of mobility. For him, technology in all these manifestations directly impacts the exercise of politics. As he argues, “it should be clear that the contexts of international relations, the behavior of most relevant actors, and even our understandings of international relations are strongly but variously colored by the technological ethic” (Dahlberg, 1973: 84). Others, such as Mumford (1970) or Winner (1977), have put forward a more pessimistic reading of the presupposed essentialist characteristics of technology, as they regard faith in technological innovation as more dangerous than liberating, and caution against unforeseen consequences and side effects from the implementation of new technologies at scale.

Independent of whether one favors an optimistic or pessimistic general stance towards technology, framing technology as deterministic is analytically compatible with the discipline’s focus on explaining change and stability in the international system. At the same time, however, such a perspective reduces technology to something that is already given and that changes the world from the outside. Determinist accounts of technology thus fail to take into account how technologies come into being and how existing social, political, and economic structures are always already imprinted on them. Even though within Strategic Studies there is a sustained tradition of research around the theme of technological innovation (e.g., Parker, 1988; Rosen, 1991; Farrell and Terriff, 2002), these perspectives seldom go beyond a determinist understanding of technology as an instrument that needs to be developed in order to create (military) power capacities.

More recently, a number of IR scholars have expressed a general discontent with the determinist analytical treatment of technology as an externalized explanatory variable for change/stability in the international system (e.g., Herrera, 2003, 2006; Fritsch, 2011, 2014; Mayer et al., 2014; Salter, 2015a; Davidshofer et al., 2017; McCarthy, 2018). These authors claim that technological development and technological practices must not be separated from the social, political, and economic structures in which they are embedded. This has

already resulted in detailed accounts of issues as diverse as transnational business governance (Porter, 2014), the legal expertise surrounding the use of drones and targeted killings (Leander, 2013), or the socio-technical construction of airport security (Schouten, 2014; Valkenburg and van der Ploeg, 2015; Hoijtink, 2017). These contributions highlight the open-endedness of processes of technological development and demonstrate that technology is never the neutral tool that it is often presented to be. On the contrary, technological development and deployment is highly political and subject to social, institutional, economic and material possibilities and constraints, alongside preferences of developers, engineers, and designers.

Taking seriously Herrera's (2003: 566) claim that "technology needs to be endogenous to politics," an understanding of technology as socially constructed helps us to overcome the determinist ontologies that have prevented the unpacking of technology within mainstream IR. Most notably, such a perspective on technology emphasizes the need to replace the totalizing imaginary of a master (human)/slave (machine) relationship – or vice-versa, depending on whether one favors an optimistic or pessimistic stance – with the idea of complex socio-technical systems in which humans and machines work together. This, as we will argue in the below, also opens up the study of technology for an understanding of agency as emergent through the interaction between human and non-human elements.

Agency in IR: agents, structures, relations

In IR, agency has been most prominently discussed as part of the "agent-structure problem" (Wendt, 1987). Starting from the question whether human agency or the social structure within which it is embedded determines international action, debates about agency have mostly been concerned with how to situate agency and structure vis-à-vis each other, as well as vis-à-vis monocausal structuralist or intentionalist theories (e.g., Dessler, 1989; Hollis and Smith, 1991; Doty, 1997; Wight, 1999). Most approaches to the agent-structure problem depart from the assumption that agency and structure are mutually constitutive, and thus look for ways of accommodating both in the analysis of international politics. Wendt (1987), for example, has suggested a "constructionist" framework that he regards as capable of accounting for the constraints that international actors face with regard to social structures, but also for the power that these actors possess to transform the structures within which they are embedded.

Despite the fact there is still a lack of shared agreement in IR about what agency actually means (Wight, 2006), agency is in IR usually considered as an exclusive concern of the human domain. This ties in neatly with much of modernist philosophy and social theory that, in the vein of the Cartesian split between mind and matter, places the liberal subject at the center of its ontology. This anthropocentric perspective rests on the presupposition that only humans possess consciousness and free will, and should therefore

occupy a preeminent position in the world. In this tradition, a boundary between the human world and the non-human world thus separates the conscious subject from the unconscious matter with which it is surrounded – supported by a Newtonian account of physics that presupposes the existence of universal natural laws that explain the causal forces which move otherwise lifeless matter. Much of mainstream social science theory, including IR, subscribes to such a scientific analytical paradigm that is predicated upon the identification of causal mechanisms in order to explain social and political action (Jackson, 2017). The capacity to act would from such a perspective necessarily be constrained to humans vis-à-vis the social structures they create.

Such an angle does however not problematize the notion of agency itself, as it brackets the question *who* can be an actor in the first place. Inspired by sociological accounts of agency (Emirbayer and Mische, 1998), Jackson and Nexon (1999) have thus suggested to analytically foreground the ways in which agency is produced through relations and the social and political entities that they produce and stabilize. Instead of homing in on the possibilities for *human* agency against the backdrop of social structures, they direct our attention to action itself, and how agency can be retraced backwards and located in interaction. The relational perspective proposed by Jackson and Nexon has several implications. First of all, it opens up the analytical toolbox of IR for influences from beyond the discipline. A relational understanding of agency speaks closely to various approaches from STS and New Materialism, and IR scholars have started to explore how these approaches can be productively integrated into IR. We will engage with these encounters in more detail below.

Second, it presupposes an empirical rather than a theoretical research agenda (Braun et al., 2018). If (political) agency emerges through interaction, detailed study of these interactions is paramount. Importantly, this implies that there must not be a totalizing account of what agency is or what it does. Rather, agency must by definition be understood as multiple, variegated, and context dependent. This again speaks closely to the sociological and anthropological tradition of empirical (ethnographic) study of scientific and technological practices in STS. STS scholars have foregrounded the analytical importance of empirical sites of inquiry, most prominently embodied in the move to study the “laboratory” as the site where scientific facts are produced and start their journey to make an impact on the world (e.g., Latour and Woolgar, 1979; Lynch, 1985; Knorr-Cetina, 1995). And even though STS work has by no means been restricted to laboratory studies, the insight that context matters for the ways in which technologies are rendered into socio-technical systems and transform the ways in which we act is persistently important.

Third, an understanding of agency as emergent through interaction does not exclude non-human elements. This acknowledgment is key when we think of

algorithmic and robotic technologies and the socio-technical systems that they constitute. As we have outlined in the beginning of this introduction, the notion of the socio-technical system challenges an understanding of non-human elements as passive objects that are fully subjected to human agency, and rather encourages us to study the role of objects in the constitution of agency, as they share or split workload together with humans. As such, a relational perspective on agency by definition challenges the modernist anthropocentric ontology. It thereby speaks closely to a broad body of scholarship under the title of New Materialism, which brings together a range of scholars from different theoretical and disciplinary backgrounds, including post- or anti-humanism, critical or speculative realism, chaos theory, complexity theory, object-oriented metaphysics, modern vitalism, or philosophy of becoming (Connolly, 2013b: 399; Coole, 2013: 452).

What New Materialism scholars, despite their variegated theoretical roots, have in common is their refusal to uphold the anthropocentrism that has long dominated modernist and liberal philosophy and social theory. As Coole and Frost (2010: 8) argue, “modern philosophy has variously portrayed humans as rational, self-aware, free, and self-moving agents” that exercise dominance over nature and technology – and it is precisely this ontological divide that has enticed New Materialist scholars to search for alternative ways of framing the relationship between the human and non-human elements of the world. Seminal contributions by scholars such as Bennett (2010), Barad (2007), Haraway (1991), or Hayles (2006) focus not only on the role of science and technology within society, but also widen the analytical scope to the ontological status of materiality itself. Starting from the assumption that “materiality is always something more than ‘mere’ matter: an excess, force, vitality, relationality, or difference that renders matter active, self-creative, productive, unpredictable” (Coole and Frost, 2010: 9), New Materialism scholars subscribe to an ontology of complexity and emergence in the context of which natural elements, technological artifacts, animals, and humans interact in creative and partly unforeseeable ways. From such a perspective, as Barad (2007: 33) writes, “the world’s radical aliveness comes to light in an entirely nontraditional way that reworks the nature of both relationality and aliveness.” Such a perspective then allows for novel modes of analyzing the social, the political, and the economic as domains that are no longer produced by human decision-making and actions alone, but by entangled, emergent, and generative powers that include a variety of non-human actors and effects.

Bennett (2010) aptly illustrates how such an understanding of the relevance of non-human forces plays out through her account of the 2003 power blackout in the US Midwest and Northeast and Canadian Ontario, which affected about 50 million people and lasted, in some regions, for an entirety of 4 days (U.S.-Canada Power System Outage Task Force, 2004: 1). Leading to the failure of the electricity grid, a chain of cascading interaction effects, almost without human interferences, unfolded such major damage to

the grid that not even fail-safe measures could prevent the blackout. As Bennett (2010: 25) writes:

[W]hat seems to have happened on that August day was that several initially unrelated generator withdrawals in Ohio and Michigan caused the electron flow pattern to change over the transmission lines, which led, after a series of events including one brush fire that burnt a transmission line and then several wire-tree encounters, to a successive overloading of other lines and a vortex of disconnects. One generating plant after another separated from the grid, placing more and more stress on the remaining participants.

In other words, one thing had led to another, with the notion of “the thing” here referring to something that is explicitly non-human. The seemingly banal acknowledgment that “the international, the globe, the world is made up of things, of stuff, of objects, and not simply of humans and their ideas” (Salter, 2015a: vii), and more importantly, the acknowledgment that these things can contribute to the constitution of agency through interaction with humans and other things, has more recently gained increasing traction within IR. Scholars have for example started to explore neoliberal capitalist practices as an interplay of social, geological, biological, and climate systems (Connolly, 2013a, 2013b), the materiality of conflict and the importance of forensic knowledge about material objects in the context of investigating human rights violations (Walters, 2014), the socio-technical assemblages of digital security practices (Bellanova and Duez, 2012), or the material dimensions of infrastructure and its implication for the politics of infrastructure protection (Aradau, 2010), and have made material aspects of the international sphere the subject of edited collections (Acuto and Curtis, 2014; Salter, 2015b, 2016) and special issues in academic journals (Srnicsek et al., 2013).

Particularly with regard to technologies that do things that humans simply cannot do themselves (e.g., recognizing and engaging an incoming hostile missile within seconds; extracting patterns from millions of database entries; simultaneously monitoring and analyzing multiple video streams), the possibility for non-exclusively human agency has provoked a number of regulatory and ethical debates. Is the current legal system, for example, capable of accommodating actions that have not been consciously carried out by humans? Could machines ever act in a morally responsible fashion? And if not, where must accountability and responsibility be located when humans and computer systems work together, but the system does things that the human operator could not do themselves? The modernist-liberal imaginary of agency revolves around the conscious individual and its volitional decision-making, leading to eventual action and consequences in the world. This causal chain establishes the possible allocation of responsibility for one’s actions, both in the courtroom and morally speaking. A notion of agency that is “decoupled from criteria of intentionality, subjectivity, and

free-will” (Sayes, 2014: 141) however fundamentally complicates the causal chain of reasoning that is elemental to the idea of responsibility.

If collectives, assemblages, networks, and mediating coalitions are conceptualized as pertinent for the production and reproduction of agency, then it becomes increasingly difficult to apply traditional legal and ethical categories. Such questions not only have practical appeal vis-à-vis the challenges that algorithmic and robotic technologies pose, but they also strike at the core of what it means to be a human being in this world. As Coole and Frost (2010: 4) put forward,

what is at stake here is nothing less than a challenge to some of the most basic assumptions that have underpinned the modern world, including its normative sense of the human and its beliefs about human agency, but also regarding its material practices such as the ways we labor on, exploit, and interact with nature.

A symmetrical understanding of ontology would indeed prescribe an ethical responsibility of acting within and with the world, rather than acting vis-à-vis the world.

Studying technology and agency in IR

This book addresses the question how agency, understood as an emergent form of interaction within socio-technical systems, comes to matter within international politics. The ways in which agency comes into being and with what repercussions must however, due to the empirical multiplicity and context sensitivity of interactions between humans and non-humans, by definition always remain situated and partial. This means that a general theory of *Technology and Agency in International Relations* is hardly possible. Such a generalization is, however, neither desirable nor is it what we are striving for here. The contributions to this book offer careful empirical analyses that place socio-technical systems within their political, legal, economic, ethical, cultural, and organizational contexts and explore how agency emerges and comes to matter. Situating technology within specific contexts thereby enables them to problematize the notion of agency and its transformations and effects in international politics. At the same time, it allows the authors to demonstrate that agency comes into being in variegated ways: voluntarily or involuntarily; planned or emergent; structured or chaotic. Thinking about technology and agency through these relations and interactions then arguably allows us to more systematically understand the implications of algorithmic and robotic technologies for international politics.

The point of analyzing agency through the study of interaction in socio-technical systems is to account for plurality and complexity, and to do so in ways that allow us to come to terms with such plurality and complexity rather than to homogenize or totalize the role of technology in international

politics and the ways in which it becomes part of political action. The study of technology and agency in IR in this sense, as Claudia Aradau (this volume) puts forward, thrives on the incorporation of multiple theoretical and methodological perspectives that allow us to embrace complexity and plurality – and thereby challenge the long-standing preference for parsimonious theory-building in IR. This book should in this sense be understood as an invitation to draw upon a multiplicity of approaches and concepts in research on technology and agency. Whereas the contributions to the book are united by the attempt to productively problematize agency and technology, they do so by means of a diverse conceptual toolbox.

Mareile Kaufmann (this volume) in her analysis of algorithms for predictive policing, Georgios Glouftisios (this volume) in his account of the construction of the Visa Information System for European border management, and Malcolm Campbell-Verduyn (this volume) in his investigation of blockchain technology and its implications for international financial regulation, all draw on the Social Construction of Technology (SCOT) literature. SCOT scholars suggest that we conceptualize technology as enmeshed with discursive and material networks, as well as with the heterogeneous controversies, conflicts, and discourses that surround them (e.g., Latour and Woolgar, 1979; Callon, 1980, 1986b; Hughes, 1983; Bijker et al., 1987; Mackenzie and Wajcman, 1999). Building on a strong notion of constructivism, SCOT approaches reject the teleological assumptions that essentialist forms of determinism posit, and instead highlight the open-endedness of processes of technological development. By means of empirical engagement with the various stages through which technologies emerge, SCOT scholars emphasize that technology is never the neutral tool that it is often presented to be. On the contrary, technological development and deployment is highly political and subject to social, institutional, economic and material possibilities and constraints, alongside preferences of developers, engineers, and designers.

Kaufmann's chapter (this volume) in this vein provides us with an interesting account of the life cycle of a technology, as it traces algorithms for predictive policing purposes from the cradle to the grave. Drawing on interviews with police staff, software developers, and programmers, she engages the consecutive stages of (pre-)conception, birth, adolescence, graduation, implementation, and death, and sketches out how each of these stages becomes subject to negotiation, controversy, and organizational and infrastructural requirements. While Kaufmann's research was initially "only" interested in questions of agency, she soon finds that larger social and political trajectories took center stage during the analysis of empirical data. To be able to understand the workings and effects of data and algorithms for predictive policing, she thus argues, a range of other elements need to be taken into account, including the importance of a longer history of technology in police work and attitudes towards data and digital methods within the police.

Glouftsiou's (this volume) analysis of the Visa Information System (VIS) – a large-scale IT system that was designed for the management of the European border framework – follows a similar approach. Building on ethnographic fieldwork and expert interviews, he highlights the dispersed ways in which the VIS emerged throughout a multi-year process that included a variety of heterogeneous elements and actors. As he follows the VIS through variegated instances of design, technical feasibility studies, political negotiations, calculations, draftings, and re-draftings, Glouftsiou manages to explicate how in the construction of technology, networks of heterogeneous elements are being tied together and rendered productive. He thereby forcefully demonstrates how multiple human and non-human elements, such as EU bureaucrats and security experts, servers, network cables, interfaces, and algorithms are involved in the constitution of the VIS system, and by extension, in the very practicing of border security, migration management and law enforcement in the EU and its neighborhood.

Another prominent way to study agency and technology in IR is through the toolbox of Actor-Network Theory (ANT), as adopted by a number of the contributions in this volume (Olbrich, this volume; Glouftsiou, this volume; Kaufmann, this volume). ANT, as advanced by Callon, Law, Latour, and others (e.g., Callon, 1984, 1986a; Law, 1986, 1992; Latour, 2005), has been particularly prominent in IR in recent years (e.g., Barry, 2013; Best and Walters, 2013; Bueger, 2013; Nexon and Pouliot, 2013; Passoth and Rowland, 2015). It starts from the assumption that social effects are produced by heterogeneous networks of actants that comprise social and technical parts, including organizations and institutions as much as things, artefacts, and humans. Each of these elements should be seen as equally important to the network, as they produce and re-produce social order in a joint fashion. ANT presupposes that all of the elements of the network are relevant for actions, whether their actions emerge in a deliberate (human) fashion or not. Latour (2005) therefore suggests using the term “actant” as opposed to the liberal expression of the “actor,” as the notion of the actant indicates that action is not necessarily tied to human intention or consciousness. Such a perspective then allows for more suitable modes of understanding non-human action. As Latour (2005: 71) has famously argued: “If action is limited a priori to what ‘intentional,’ ‘meaningful’ humans do, it is hard to see how a hammer, a basket, a door closer, a cat, a rug, a mug, a list, or a tag could act.”

One of the things that ANT then brings to the study of international politics is a concern with the place of non-humans in political life and the effects of relational practices between humans and non-humans. From an ANT perspective, agency is always entangled and distributed. In addition, an ANT approach advances the study of technology in international politics by drawing specific attention to the link between situated and local practices of knowledge production and their broader effects, or to how particular knowledge claims or truth claims gain content and political importance.

In his chapter on the use of satellite imagery for the monitoring of human rights abuses, Philipp Olbrich (this volume) draws on ANT to point out how satellite technology becomes a participant in the making and re-making of North Korea as a security threat and pariah state. For Olbrich, the use of satellite technology has a key impact on what can be known (or not known) about human rights abuses, conflict, or political violence on a global scale. In turn, what is presented as evidence through the use of satellite technology has important effects for how the international community engages with North Korea – or, rather, disengages with North Korea, as practices of satellite surveillance reify the image of North Korea as a pariah state and further limit the potential for dialogue. Finally, as Olbrich shows, in the process of making North Korea visible and producing evidence, satellite imagery itself remains largely unquestioned. In fact, in the process of conducting satellite surveillance, satellite technology is further reified as an objective, neutral, and desirable way of examining human rights violations.

Applying a slightly different perspective on the relations between humans and technology and the resulting effects for the production of agency, the contributions by Katja Lindskov Jacobsen and Linda Monsees (this volume) and Malcolm Campbell-Verduyn (this volume) are informed by Sheila Jasanoff's (2004) work on co-production. Jacobsen and Monsees argue that the concept of co-production – even though somewhat under-acknowledged within IR – is particularly suitable for studying technology and technological agency in international politics. For them, the way in which co-production places specific emphasis on how science and technology, or the making of scientific knowledge or facts, affects social order and hierarchies has important analytical value in the sense that it re-introduces key questions in IR, such as global power, inequality, and norms. Campbell-Verduyn's inquiry into the governance of international finance foregrounds the political and economic perception of blockchain technology that changes from a framing of the blockchain as a threat to established financial institutions to the incorporation of blockchain technology within the liberal capitalist system. He highlights the role of blockchain technology as co-productive of the transformation of international finance, arguing that the blockchain has produced and legitimized the power of its users, while at the same time being subjected to the influence of its users. Forms of political agency that are produced through this interaction between human and technological authority then unfolded global repercussions in the sense that they provided the conditions for further extending liberal governance modalities in the wake of the 2008 global financial crisis. Both Campbell-Verduyn and Jacobsen and Monsees manage, through the concept of co-production, to explicate how both discursive and material aspects of technology come to matter in the ways in which agency is produced.

This relation between discourse and materiality is also key in the work of Suchman (2007, 2012) that Leese (this volume) mobilizes in his analysis of

human-machine relations in military weapons systems. In order to understand what might be at stake in the future of warfare against the backdrop of potentially “autonomous” weapons systems, Suchman’s concept of configuration for him provides a productive lens, as it directs analytical attention to the specific ways in which humans and machines share or split tasks, and how their relationship revolves around notions of automation and control. Leese’s analysis in this sense highlights the role of cultural imaginaries that inform the construction of socio-technical systems, and particularly the idea of “meaningful human control” over automated system functions. In doing so, he draws specific attention to the presupposed boundary between humans and computers that is within socio-technical systems engendered through the notion of human control.

A slightly different perspective is applied by Alex Edney-Browne (this volume) in her analysis of visibility within practices of drone warfare. In order to demonstrate what can go wrong when humans and technologies work together, she engages practices of drone warfare and how the fallibilities of human-machine interaction on the battlefield can unfold lethal consequences. Building on visual IR theories and critical military studies, she puts forward powerful concerns with regard to the growing authority of visual technologies in military affairs. As she works through the notions of failure and fallibility, Edney-Browne’s analysis points to the importance of examining and uncovering the flaws that are inherent in algorithmic and robotic technologies and the socio-technical systems that they comprise. Such a critical stance then challenges techno-fetishization and questions military institutions’ embellishments about their technological capabilities.

Finally, in her reflections on technology and agency in international politics, Claudia Aradau (this volume) urges us to expand our analytical toolbox even further, by also including feminist and post-colonial perspectives on technology and agency and by paying explicit attention to the multiplicity and debates within STS and IR. In our interview with her, which serves as a conclusion to the book, Aradau elaborates, among other things, on questions of the global circulation of technology, the role of technology in the production of knowledge and broader issues of secrecy, critique, and politics. Aradau thereby draws particular attention to the ways in which distributed and entangled modes of agency produce specific forms of knowledge, or act upon our bodies in specific ways. According to her, a symmetric reading of the world could and should still lead to an engagement with how asymmetric relations of power, authority, and knowledge are produced. This would then also direct attention to questions of who or what gets to speak and act, or what counts as evidence. For her, these questions are underpinned by particular relations between actors, but also by the technologies, forms of equipment and instruments that these actors can have or interact with.

Overall, IR scholars have in recent years made sustained and encouraging efforts to render ideas and concepts from STS and New Materialism

productive for the study of the international, which has resulted in a variety of efforts to re-appropriate our understanding of technology and agency in international contexts. However, as Salter (2015a: xviii–xix) notes, these efforts still resemble a “party not quite in full swing.” In other words, there remains much empirical and conceptual work to do. With this book, we hope to offer a contribution to the debates by foregrounding the importance of agency, specifically with regard to algorithmic and robotic technologies. If we perceive of agency in relational and entangled forms that emerge through the interactions between heterogeneous elements, we should turn our attention to these interactions, and the ways in which they bind humans and non-humans together. A “flat” or symmetric reading of ontology as proposed by STS and New Materialist scholars then not only requires us to rethink what it means to act in the world, but also raises a set of questions that concern the ways in which international politics are structured.

Notes

- 1 Being aware of the risk to oversimplify the many different types of technologies that hold relevance for international politics, we will throughout this introduction refer to “algorithmic and robotic technologies,” as this term covers both physical (“hardware”) and digital (“software”) aspects. The most intense debates about technology can usually be encountered when both of these aspects are combined, i.e. when technologies are rendered “intelligent” based on sensing and algorithmic processing capacities, while at the same time able to move around and interact with their environment.
- 2 When we speak here of politics in relation to technology, we do not refer to regulatory debates or to the governance of technology, but rather to the ways in which technology is embedded in politics and/or has political effects by means of its interaction with humans.

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