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# Information Matters: Informational Conflict and the New Materialism

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# Abstract

This paper focuses upon the challenge posed by the concept of ‘information’ to the new materialisms, viewed with reference to the multifaceted worldly phenomenon of informational conflict. ‘Informational conflict’ is a broad term designed to encompass the hi-tech ‘cyber’ operations of inter-state warfare as well as the informational actions of non-state actors, and is contingent not upon information technologies, as commonly understood, but upon ‘information’. Informational conflicts can be viewed as sociotechnical assemblages of humans and non-humans although information is a problematic component of these assemblages, on account of its uncertain ontological status. This paper addresses the ontology of information and asks how the new materialisms might respond in the various ontological registers described. Drawing upon the natural sciences—especially physics—and the emerging ‘philosophy of information’ to outline the metaphysics of information and the differences that exist in its ontological characterisation, the paper outlines informational challenges to materialist perspectives. It concludes by examining two examples of how information and materiality are addressed in International Relations with respect to informational conflict. It concludes by noting the positive contributions the new materialisms can make to the study of information and informational conflict, but challenges them by asking: Information matters for conflict; does it matter for materialism?

Keywords: information; materialism; International Relations; conflict; information warfare; Internet.

The war, started in the sky, will be continued in the heaven of Mathematics.

—Friedrich Kittler[[1]](#footnote-1)

We know next to nothing of what this thing you are studying—*information*—is.

—Bruno Latour[[2]](#footnote-2)

# Introduction

In 1948, Norbert Wiener, regarded as the founder of modern cybernetics, issued a challenge to scientists and philosophers alike: ‘Information is information, not matter or energy’, he wrote. ‘No materialism which does not admit this can survive at the present day’.[[3]](#footnote-3) Wiener asserted information as an ontological category distinct from the physical categories of matter and energy, which must be taken into account when constructing theories and models of reality. Whether we agree with Wiener’s thesis or not, there remains a tension between the apparent immateriality of information and the materialities of materialism. Materialism takes seriously the notion that things matter. Self-consciously contrasting themselves to the ‘cultural turn’ of 20th-century enquiry, contemporary materialists dispense with the privileging of the human subject in favour of affording possibilities of political agency to the non-human inhabitants of the universe. At its heart, write the editors of a recent volume dedicated to the plurality of ‘new materialisms’, materialism proposes that ‘foregrounding material factors and reconfiguring our very understanding of matter are prerequisites for any plausible account of coexistence and its conditions in the twenty-first century’.[[4]](#footnote-4)

Recognising fully that the long heritage of materialism in philosophy and the natural and social sciences is being rediscovered, Coole and Frost suggest that in many cases the newness of ‘new’ materialisms be rendered more accurately as ‘renewed’.[[5]](#footnote-5) Whilst contemporary vicissitudes may be giving us cause and opportunity to re-examine the world through a materialist lens, many of the questions we wish to answer are perennial, regarding our interaction with nature and the physical objects of our own creation. This paper seeks to renew our acquaintance with one such issue, that of the ontological status of information, through a reading of contemporary informational conflict. It is not my intention to resolve this issue—indeed, I would argue it is not currently possible to do so—but to draw attention to the challenge information poses for the new materialisms. Informational conflict—a broad concept encompassing phenomena like information warfare, hacktivism and cyber war—is a topic of substantial interest to students and practitioners of world politics alike and, in its reliance on informational concepts, provides an opportunity to examine what we mean by ‘information’ and better understand where information fits into our ontological schema as encountered in International Relations.

This paper is organised in five sections. In the first section, I introduce the concept of ‘informational conflict’, a broad term encompassing the hi-tech ‘cyber’ operations of inter-state warfare as well as the political informational actions of non-state actors. Informational conflict is contingent not upon information technologies, as commonly understood, but upon ‘information’. The second section proposes that informational conflicts can be viewed as sociotechnical assemblages of humans and non-humans but that information itself is a problematic component of these assemblages, on account of uncertainty over its ontological status. The ontology of information is addressed directly in the third section, and asks what types of ontology are we concerned with, and how the new materialisms might respond in the various ontological registers described. The fourth section draws upon the natural sciences and the philosophy of information to outline the (meta)physics of information and the differences that exist in its ontological characterisation, which pose challenges to materialist perspectives. The fifth section examines two examples of how information and materiality have been addressed in the International Relations literature with respect to informational conflict, and what the implications are for the conduct and analysis of informational conflict. I conclude by noting the positive contributions the new materialisms can make to the study of information and informational conflict, and ask the question: information matters for conflict; does it matter for materialism?

# Informational Conflict

What is informational conflict? Some hesitation should accompany any attempt to introduce another term into a field already overflowing with neologisms. One common example is ‘cyber’, a back-formation from ‘cybernetics’, a sense which has all but been lost through its contemporary excessive use.[[6]](#footnote-6) In politics and security, it is now common to find ‘cyber’ affixed to any number of established concepts—crime, terrorism, security, deterrence, war, etc—either as a (non)hyphenated prefix or as an adjectival noun. It finds occasional expression as a standalone noun, as in ‘a fortress mentality will not work in cyber’.[[7]](#footnote-7) Passing through a transitive verb phase it also appears in the adjectival form ‘cybered’.[[8]](#footnote-8) Dunn Cavelty suggests that ‘cyber’ is one of an ‘arsenal of new expressions’ including ‘digital’ and ‘information’ that are deployed so indiscriminately that ‘they can basically mean everything and nothing’.[[9]](#footnote-9) In the political context, however, it is employed generally as a cipher for ‘computer network’. Phenomena categorised as ‘cyber’ are therefore contingent upon the use or existence of computer networks. This should be understood in a predicative rather than deterministic sense and further serves to distinguish ‘cyber’ conflicts from the wider set of ‘information warfare’ concepts of which it is part. We can illustrate this latter point by examining briefly the concept of ‘cyber war’.

The etymological and conceptual roots of most current formulations of ‘cyber war’ are in the so-called Revolution in Military Affairs that spread from the Soviet Union to the West in the 1970s and 1980s.[[10]](#footnote-10) In particular, models of information warfare (IW) are central to its evolution, in which information warfare is understood broadly as ‘the use of information to attack information’.[[11]](#footnote-11) This definition of IW is therefore contingent upon information, rather than information technologies, as is sometimes supposed.[[12]](#footnote-12) Information warfare may certainly include information-technological practices like electronic warfare but also incorporates psychological warfare, economic information warfare and propaganda.[[13]](#footnote-13) The definitions of information warfare that have emerged since the end of the Cold War ‘range from those narrowly focusing on the improved use of electronic means to achieve advantage on conventional battlefields to very broad definitions conceptualizing information warfare as any effort to affect information systems in peacetime and wartime’.[[14]](#footnote-14)

Although ‘information warfare’ retains no small degree of popular currency it has largely fallen out of military and political use, especially in the West, as its specificity has been diluted due to large-scale changes in the complexity of the information-technological landscape itself, not least of which is the growth of the civilian Internet.[[15]](#footnote-15) Whilst ‘the use of information to attack information’ clearly has conceptual utility its practical application is rather hindered by the many categories that might be so characterised. The propaganda aspects of information warfare have become part of ‘information operations’ (IO), ‘influence operations’, ‘strategic communications’, and so forth, waging what Der Derian calls ‘an epistemic battle for reality’ and others ‘cybercortical warfare’ and similar terms.[[16]](#footnote-16) Various technical operations have been incorporated or diversified into ‘network-centric warfare’, ‘network-enabled warfare’ and, more recently, ‘computer network operations’.[[17]](#footnote-17)

One of the terms that has gained currency—and notoriety—in this way is that of ‘cyber war’. The ‘cyber’ component of this definition seeks to refine the information component of information warfare to that which is enabled by information technologies, specifically those of networked digital electronic computers. In this sense, it is a subset of information warfare, but one restricted to computer networks. Its tactical variant ‘cyber warfare’ is therefore roughly synonymous with the military term ‘computer network operations’, which incorporates both offensive and defensive modes.[[18]](#footnote-18) ‘Cyber war’ is most readily understood as the strategic manifestation of such computer network operations. The intentional computer network element of such phenomena is the sense sustained in most uses of ‘cyber’, including that of ‘cyber conflict’.

It has proven difficult to define ‘cyber conflict’ narrowly and attempts to do so have been stretched to incorporate all manner of phenomena. In an early study, Karatzogianni identified two specific forms of cyber conflict, which she defined as ‘political conflict in computer mediated environments’: first, ‘between ethnic or religious groups fighting in cyberspace as they do in real life’, and second, ‘between a social movement and its antagonistic institution (hacktivism)’.[[19]](#footnote-19) Examples of the former include the Israel-Palestine conflict and the dispute over Kashmir; of the latter, Chinese dissidents’ use of the Internet and state counter-regimes of censorship and repression. However, in both cases Karatzogianni used ‘cyberconflict’ to refer to ‘conflicts of the real world spilling over to cyberspace’.[[20]](#footnote-20) Later studies by Karatzogianni and colleagues show how both state and non-state actions are considered forms of cyber conflict, including cyber terrorism, cyber war, and the ongoing struggle between the computer security industry and the ‘computer underground’ of hackers and crackers.[[21]](#footnote-21)

An alternative approach is taken by policy- and strategy-oriented scholars, who array forms of cyber conflict along a spectrum or continuum. Liles suggests that ‘If we accept that cyberspace is nothing more than a new type of terrain, then the entire conflict spectrum should be found within and on that terrain’.[[22]](#footnote-22) He proposes four categories of cyber conflict: cyber crime, cyber espionage, cyber terrorism, and cyber warfare. Lawson expands this model slightly, arranging forms of computer network mediated operations from the least to the most ‘damaging or dangerous’.[[23]](#footnote-23) The continuum thus traced is from internet activism to hacktivism, through cyber crime and cyber espionage, to cyber terrorism and cyberwar. Neither typology takes much account of how conflicts arise and are driven by an understanding of the state as principal security referent, thereby eliding many other forms of conflict in which the state is not necessarily implicated or engaged. For similar reasons, legal analyses fail to capture situations involving individual non-state actors and cyber conflicts between states.[[24]](#footnote-24) As these authors readily concede, it is often not possible to discern where one form of conflict begins and another ends, such is the fluidity and interdependence of various modes of action and indeed of the actors themselves.

Definitionally, informational conflict borrows from information warfare and from cyber conflict in two principal ways. From information warfare it adopts the sense of using information to attack or otherwise subvert information, with or without a technological substrate. From cyber conflict it takes the inclusion of state and non-state actors and their diverse political objectives. Informational conflict is therefore any political conflict waged through informational means, a deliberately broad definition that will be explored further as the argument progresses, in particular the deliberate ambiguity that derives from using the adjectival form, ‘informational’. There is no generally accepted definition of ‘political conflict’, nor indeed of ‘conflict’, but borrowing from conflict management studies, political conflict will be understood as a process beginning ‘when one party perceives that another has frustrated, or is about to frustrate, some [political] concern of his’.[[25]](#footnote-25)

This broad definition has three initial benefits for our analysis. One, it makes no presumption as to the status of the actor or its actions: informational conflict need not refer to the actions of states or to military operations. This is in contrast to many academic explorations of, for instance, ‘cyber war’ or ‘cyberwar’—the hyphenation is erratic—which rely upon at least one engaged actor being a state military or security force.[[26]](#footnote-26) Two, it need not be contingent upon an information-technological substrate, although it clearly often is. Three, it does not assume any form of ‘digital dualism’, in which ‘cyberspace’ and the ‘real world’, or ‘online’ and ‘offline’ are mutually opposed. Rather, we should view informational conflict in terms of heterogeneous ‘informational conflict assemblages’ of material and immaterial entities that emerge and dissipate, often with great rapidity, as the following discussion demonstrates.

# Assembling Informational Conflict

Informational conflicts are very commonly mediated by the Internet and associated information infrastructures, which are not composed only of material technologies but also of people. ‘Computer networks are social networks’, assert sociologists Wellman and Hampton: ‘When computer networks connect people and organizations, they are the infrastructure of social networks’.[[27]](#footnote-27) Prioritising hardware in discussions of infrastructures is to elide people’s role as ‘one of the most substantial parts of the information “infrastructure”, as they provide, manage, and generate new information, operate, maintain, and occasionally even subvert other elements of information infrastructure’.[[28]](#footnote-28) These infrastructures are therefore readily characterisable as sociotechnical assemblages.[[29]](#footnote-29) Despite the substantial theoretical work on the ‘assemblage’ concept, it is employed here as ‘a sort of anti-structural concept that permits the researcher to speak of emergence, heterogeneity, the decentred and the ephemeral in otherwise ordered social life’.[[30]](#footnote-30) We may also use ‘assemblage’ to speak of ‘systems that mix technology, politics, and actors in diverse configurations that do not follow given scalings or political mappings’.[[31]](#footnote-31)

Not only can we regard information infrastructures as sociotechnical assemblages but we can also speak of ‘conflict assemblages’. This approach conceives of conflict as a system: ‘an interconnected and open collection of actors which attains a level of consistency that lets them function together’. [[32]](#footnote-32) As Srnicek notes, conflict is not the absence of order but the emergence of a new form of order in which human and material actors are imbricated in complex, dynamic systems.[[33]](#footnote-33) Moreover, non-human objects, ‘placed in relation to a larger assemblage …. begin to limit, constrain, shape, make im/possible, create, and produce new functions’.[[34]](#footnote-34) Conflict, therefore, ‘is not a battle between two macro-actors, but rather a micro-functional and often self-perpetuating and self-sufficient system that emerges from the connection between human and nonhuman actors of varying sizes within a single assemblage’.[[35]](#footnote-35)

We might therefore propose the existence, however ad hoc or temporary, of ‘informational conflict assemblages’. These would include—in a highly selective list—persons engaged in conflict practices, hardware directly tangible by them, infrastructure across which they operate (from undersea cable and terrestrial server farms to orbital satellites), and political groups with which they affiliate. These assemblages are comprised of humans and non-humans in dynamic and shifting networks of cooperation and allegiance that enlist actors and agents for political purposes. Each of these assemblages draws upon material resources for their sustenance, which are converted into work through the assemblage. Each assemblage must continue to be ‘performed’ in order to stabilise and survive.[[36]](#footnote-36) Assemblages and their components do not exist in isolation and may be ‘plugged’ into others, as shown by the versatility of contemporary Internet collectives like Anonymous to switch tasks and perform work elsewhere with great rapidity and efficacy.[[37]](#footnote-37) State actors too, who often lament the lack of ‘nimbleness’ in their institutional webs, aim to reconfigure and repurpose their informational conflict assemblages as circumstances demand.[[38]](#footnote-38) Importantly, these assemblages do not map readily to increasingly awkward notions of ‘on-’ or ‘offline’.[[39]](#footnote-39) After all, as Boellstorff asks—a question that will become more important as this discussion progresses—‘What, nowadays, is not digital in some way?’[[40]](#footnote-40)

What might materialist approaches to informational conflict assemblages tell us? Deibert advocates paying attention to the ‘material foundation’ of global information technologies, as they ‘present a formidable set of real constraints on the realm of the possible’.[[41]](#footnote-41) Examining these material constraints reveals ‘methods of control and authority, many of which are buried within the subterranean layers of the network’.[[42]](#footnote-42) Aradau agrees, arguing that the materialities of critical infrastructures have been marginalised by the focus, by constructivist scholars in particular, on critical infrastructure protection as a discursive practice. Aradau observes that in the ‘materialization of what is to be made secure, infrastructure plays an agential role, both constraining and enabling particular configurations of social and cultural practice’.[[43]](#footnote-43) We can see these dynamics at various scales of information infrastructures. At the societal level, new modes of surveillant governance have emerged through the integration of national security with digital systems like the Internet.[[44]](#footnote-44) Within the rather more quotidian context of consumer electronics in the pocket and the home, technologies of content regulation and restriction enforce and consolidate the interests of dominant political and economic actors against those of consumers.[[45]](#footnote-45)

However, such approaches may tell us less than we expect about specific conflicts. The principal vectors of most informational conflicts are computer networks, yet the physical hardware components of these networks are, paradoxically, those which tell us the least. Military and other specialised systems aside, communications networks like the Internet are ‘dual-use’, in that they may be used for both peaceful and belligerent purposes. Whilst certain types of machine can be engineered to constrain what activities are carried out through them, in and of themselves they tell us nothing about the code carried within them, particularly at some past time. They are unlikely to illuminate much the nature and conduct of informational conflicts, even as they might tell us many other fascinating tales, of invention, commercialisation, adoption, manufacture and discard.[[46]](#footnote-46) It would be wrong-headed to assert that information technological artefacts are mute with respect to important social and political phenomena―whole fields of social scientific enquiry attest otherwise―but we would find it difficult to recover evidence of relevant conflict behaviour from these technological artefacts alone.[[47]](#footnote-47) As Rosenau suggests, information technologies are ‘second-order dynamics that influence, contextualise, facilitate, permit, or inhibit courses of action’ rather than ‘first-order dynamics that change, transform, foster, impose, or shape courses of action’.[[48]](#footnote-48) We would, from a materialist standpoint, struggle to explain how first-order informational conflicts emerged from these second-order material components.[[49]](#footnote-49)

Deibert and Rohozinski write that ‘cyberspace’ is ‘both a material and a virtual realm—a space of things and ideas, structures and content’.[[50]](#footnote-50) Information infrastructures like the Internet have analytically identifiable physical components but also ‘an equally important immaterial, sometimes very elusive (cyber)component, namely the information and content that flows through the infrastructure, the knowledge that is created thereby, and the services that are provided’.[[51]](#footnote-51) Information infrastructures are both material and immaterial.[[52]](#footnote-52) However, if the new materialism as encountered in contemporary politics has applicability to the world in general, it must be able to account for this informational component. We need to address the ontology of ‘information’ as a first step to reconciling materialism with the ‘immaterial’.

# Ontology of Information

Attempts to interrogate the ontology of information are rare in studies of global politics and conflict. Whilst significant and growing attention has been afforded the political impacts of an ‘informationalisation’ of the contemporary world, these discussions very often reduce to the *technologies* of information, understood in this instance rather simplistically as hardware and software, rather than to information itself, whatever that may be. Those investigations that delve further into the nature of information interpret information as ‘digital information’ or ‘code’, either concept being a rather specialised form of information not given its due conceptual contextualisation except, again, against the backdrop of physical technologies. There exist many sophisticated discussions, prompted by the wonders and threats of the modern technological age but which are not contingent upon technology *per se*, that deal with propaganda and persuasion and for whom ‘information’ is a keystone concept. Such analyses have many virtues yet also miss the opportunity to interrogate the nature of information itself.

We should not be too harsh on such work—its priorities lie elsewhere—and, after all, to attempt to define *all* one’s terms is at best a fool’s errand, at worse an invitation to infinite regress. However, Luciano Floridi, one of the principal contributors to an emerging ‘philosophy of information’, noting that information is indeed an ‘elusive concept’, asserts that this is ‘a scandal not by itself, but because so much basic theoretical work relies on a clear analysis and explanation of information and of its cognate concepts’.[[53]](#footnote-53) To paraphrase Floridi, the ‘scandal’ is not that information is a slippery beast but that influential treatises on ‘information age’ politics and security rely on conceptualisations of information that are very poorly articulated, if at all.[[54]](#footnote-54)

If we accept Jackson’s invitation to ‘foreground’ ontology in IR, what sort of ontology are we talking about?[[55]](#footnote-55) Returning briefly to the concept of conflict assemblages, Srnicek notes that his formulation of the conflict assemblage is a ‘theoretical ontology’ rather than a ‘philosophical ontology’: ‘it merely posits certain conceptual entities as pragmatically useful and scientifically explanatory’.[[56]](#footnote-56) This reflects Patomäki and Wight’s distinction between ‘philosophical’ and ‘scientific’ or ‘social’ ontologies, in which enquiries into the former logically, if not always practically, precede the latter.[[57]](#footnote-57) Jackson observes that IR scholars tend not to distinguish satisfactorily between these two types of ontology, such that ‘ontological’ debates reduce to competing ‘worldviews’ (scientific ontologies) and ‘empirical disputes’, rather than interrogating our ‘hook-up’ to the world (philosophical ontology).[[58]](#footnote-58) The present enquiry offers itself in the philosophical rather than scientific ontological spirit, although the subsequent discussion suggests that this differentiation might not be sustainable with respect to information, an issue that critics will doubtless raise.

We might deflect this somewhat by observing that all ontologies are equivalent in the specific sense that they are equally valid as means of describing what is ‘real’. This is not identical with asserting that they are the same—they may indeed be very different—but that they have equal ontological status. To deploy an illustrative example from physics, since the 19th century our understanding of the ‘fundamental’ constituents of matter has changed from an atomism barely altered since ancient Greece to one that recognises the existence of sub-atomic entities (protons, neutrons, electrons). Since the 1960s, we have established that the nuclear particles (protons and neutrons) are themselves comprised of quarks.[[59]](#footnote-59) More recently again, string theories have suggested that the electron and quark point-particles are actually one-dimensional ‘strings’, variations in the oscillations of which give rise to different types of particle, even if experimental evidence for these entities is circumstantial. If we accept the superstring theory perspective of matter, atoms, nuclear particles, electrons, quarks and strings exist at different ‘levels’ of reality but have equal ontological status. However, we cannot be sure that there are not yet more ‘levels’ of physical reality to which we currently do not have access.[[60]](#footnote-60) As Schaffer has pointed out, there are no grounds to suggest the existence of a fundamental level of reality and it may be prudent to assume the possibility of ‘infinite descent’ in the structure of reality.[[61]](#footnote-61) Ontologically, ‘No level is special’.[[62]](#footnote-62)

The claims made upon ‘information’ in the IR literature are understandably at the level of ‘scientific’ ontology, even if they are rarely articulated as such. It is more common to expect the reader to jump intuitively between the registers of information as ‘data’, ‘knowledge’, ‘wisdom’, rather than disambiguate explicitly this ‘mongrel concept’.[[63]](#footnote-63) Floridi summarises the three senses in which ‘information’ is used: ‘information *as* reality (e.g. as patterns of physical signals, which are neither true nor false), also known as *environmental* information; information *about* reality (semantic information, alethically qualifiable); and information *for* reality (instructions, like genetic information, algorithms, orders, or recipes)’.[[64]](#footnote-64)

These distinctions *are* registered in work on global politics and conflict, even if they constitute a small sample of the published research on ‘information age’ issues. Libicki’s work on military strategy and operations relies on distinctions between different forms of information, particularly between the syntactic (information for reality) and semantic (information about reality) ‘layers’ of ‘cyberspace’, for example.[[65]](#footnote-65) Noting how ‘information’ has become a major constitutive force in military and political affairs, Brunner and Dunn Cavelty are keen to differentiate between information as ‘data’ and information understood in ‘more epistemological or cognitive terms, as a resource for the shaping of perception and imaginary’.[[66]](#footnote-66) The early US pioneers of thinking about information and warfare, Arquilla and Ronfeldt, have long distinguished between the ostensibly cognate concepts of data, information, knowledge and, even, wisdom, that permeate thinking in this field. Indeed, the differences between them influence what forms of conflict emerge with respect to them.[[67]](#footnote-67)

However, even when made ontologically, if not philosophically, visible, it is clear that information can be deployed in various ways, depending on the ‘requirements and desiderata’ of the theoretical orientation in question.[[68]](#footnote-68) Practically, this is often not a problem, as the human animal is capable of discerning linguistic intent with some sophistication. Theoretically, it is clearly an issue that needs addressing, and no-one concerned with developing materialist approaches to world politics can gloss over the ontology of information once this ‘scandal’ has been exposed. Floridi asserts that we are informational organisms (inforgs), living and interacting in an all-encompassing ‘infosphere’, and that the centrality of information is ‘re-ontologizing’ our world.[[69]](#footnote-69) What is this ‘information’, and in what ways can materialist approaches to reality respond?

# Information and Materiality

Like its intellectual antecedents, the new materialisms are informed strongly by the natural sciences of the day, in particular those breaking ground in the study of the complex, the non-linear and the emergent. Moving beyond a Newtonian worldview, these fields of enquiry stress the indeterminacy and contingency of the natural world, its capacity for self-organisation and adaptation, the role of thresholds beyond which irreversibility lies, and the unknowability of future states of existence. The insights of biology, neuroscience, quantum mechanics and many other fields have been brought to bear on the pasts, presents and futures of human experiences, such that we may discern a ‘complexity turn’ in the social sciences that has undermined the traditional certainties of cause and effect, and which has caused us to think anew about the derivation, character and trajectories of social order.[[70]](#footnote-70) These insights have made their way into International Relations also, to the extent that some authors have even proposed the development of a distinct brand of IR in ‘Complex International Relations Theory’.[[71]](#footnote-71)

The emphasis on dynamic systems and emergent complexity has catalysed forms of materialism that, instead of relying upon a conception of matter as inert and unchanging in its Cartesian cocoon, view matter as being in a process of constitution and remaking, and as having agency in the world. This is a ‘materialism that materializes’, that ‘renders matter active, self-creative, productive, unpredictable’.[[72]](#footnote-72) The work of Deleuze and Guattari, in particular, has provided fresh perspectives on materiality and been enthusiastically applied and reworked to describe and explain how matter and energy (two sides of the same Einsteinian coin, to employ a simplistically dualist metaphor) catalyse social change and organisation.[[73]](#footnote-73) The role of ‘information’ in these processes is unclear, however, and reflects to some extent the uncertainty over its ontology in the physical sciences, where the relative primacy of matter and information continues to be a source of disagreement.

We opened this discussion by quoting Wiener’s assertion that information constitutes a separate and distinct ontological category from matter/energy and, of course, from ‘mind’. This is an inherently metaphysical question, concerned as it is with ascertaining what exists in reality. For Floridi, ‘Wiener’s Problem’ is one of eighteen ‘open problems’ in the nascent philosophy of information, and he poses a secondary question: if information is an independent ontological category, how does it relate to the material and to the mental?[[74]](#footnote-74) Floridi’s solution is to propose an ‘Information Structural Realism’, in which reality is composed of informational structures at various epistemic ‘levels of abstraction’.[[75]](#footnote-75) This model does not describe reality in itself but rather levels of observable reality amenable to modelling and theorising. It preserves the unknowable Kantian *noumenon* and admits of the cosmos the possibility of infinite descent: ‘It might be Russian dolls (informational objects) all the way in’.[[76]](#footnote-76) ‘As far as we can tell’, writes Floridi, ‘the ultimate nature of reality is informational’, but we cannot currently know whether this is the case or not.[[77]](#footnote-77) This is an honest appraisal, if not one that is likely to appeal to some adherents of new materialist approaches, not least those identifying with the post-Kantian strand of ‘speculative realism’, for whom the Kantian distinction between human and world ‘cannot serve as the foundation for philosophy’.[[78]](#footnote-78)

Although he would deny it, Floridi’s critics might charge that his form of informational realism is closely allied to other models that might be characterised as ‘it from bit’. That is, which theorise the emergence of matter from information, rather than the converse. ‘It from bit’ is most closely associated with physicist John Archibald Wheeler, who stated: ‘every *it*—every particle, every field of forces, even the spacetime continuum itself—derives its function, its meaning, its very existence entirely—even if in some contexts indirectly—from the apparatus-elicited answers to yes or no questions, binary choices, *bits*’.[[79]](#footnote-79) Not only does matter therefore derive from the informational quality of reality itself (bits) but so too do the laws of nature which allow for the relations between forms of matter.[[80]](#footnote-80) In the form of ‘pancomputationalism’—which is an independent position to Wheeler’s digital ontology, although clearly related[[81]](#footnote-81)—the universe is understood literally as a computer, a physical system that registers and processes information—in effect, the universe computes itself.[[82]](#footnote-82) Others suggest the universe may be the output of some indiscernible and external informational structure, including that the universe is itself a computer simulation.[[83]](#footnote-83) These (meta)physical frameworks do not rely on the technological framing of information: information has independent ontological reality, whether or not it is conveyed by technological or other material means.

Contrasting theories propose that information emerges from matter-energy—‘bit from it’—although these are rather less numerous. Peacocke terms these ‘emergentist monism’, in that ‘everything [including information] can be broken down into whatever physicists deem to constitute matter/energy’.[[84]](#footnote-84) Such views have less currency now than they would perhaps have had a century ago, as they align with materialist perspectives originating before the scientific revelations of the 20th century, in particular quantum mechanics.[[85]](#footnote-85) However, others like Julian Barbour will maintain that quantum mechanics itself is grounds for dismissing Wheeler’s thesis, and that it is ‘things’, not information, that are primary.[[86]](#footnote-86)

What is more commonly argued, however, is that there is an artificial distinction between matter and information that plagues materialist approaches to reality. Hayles traces the divorce of information from a material base from the early years of information theory after World War II to the contemporary ‘condition of virtuality’ that privileges the informational over the material.[[87]](#footnote-87) Hayles’ analysis is offered as a counter-balance to this shift towards the informational, one that ‘understands human life is embedded in a material world of great complexity, one on which we depend for our continued survival’.[[88]](#footnote-88) The division between matter-energy and information assumes that they even can be separated, a situation Smith and Jenks find ‘increasingly untenable. Without information, the autopoesis of the “material” body could not be there …. Beyond a certain level of complexity, neither is conceivable without the other’.[[89]](#footnote-89) There are therefore no *a priori* grounds for positing the primacy of either the material or the informational.

There exists here a boundary across which we seemingly cannot cross. Neither science nor metaphysics can determine the fundamental nature of information, nor indeed of matter-energy, with any certainty. It remains for science to continue testing its models through experiment and reflexive theory-building; it remains the task of metaphysicians to keep watch on and pick apart our models of reality.[[90]](#footnote-90) Both are labouring on the same problems, albeit with different tools and methods, and neither operates in ignorance of the other. Whether the epistemic barrier to knowing the true status of matter-energy and information constitutes a truly Kantian membrane between phenomenon and noumenon is itself probably unknowable. However, the need persists for the new materialisms to recognise these debates and to account for information in their conceptual schema. As social scientists, we are unlikely to resolve these metaphysical matters, but we are bound to consider their implications for our enquiries into worldly phenomena. Within IR, we need to discuss if and how these debates affect us and what implications there might be for the specific topic of informational conflict.

# Informational Conflict and the New Materialism

It might be said, owing to the tendency to reduce information to the technology which carries it, that most treatments of information in IR fall into the broad category of ‘bit from it’ emergentism, if not outright technological determinism, a perspective with which IR is not unfamiliar.[[91]](#footnote-91) Information is regarded as a feature of phenomena like ‘cyberspace’, contingent upon ‘hard’ technologies, and is thus derived from an *a priori* materialist standpoint privileging the physical-spatial (understood metaphorically or otherwise) over the informational.[[92]](#footnote-92) The nature and characteristics of information itself are almost always approached via the back door rather than the front. Should we prioritise the informational over the material, however, we are presented potentially with a different form of determinism. Critiques of the physicists’ ‘it from bit’ thesis, particularly in its pancomputational inflection, draw attention to its key characteristic of informational determinism and the metaphysical problems that arise from this.[[93]](#footnote-93) However, we need not conflate materialism with determinism—they are not equivalent—but should rather acknowledge the entanglement of materiality with information, and with the social and the political.[[94]](#footnote-94) This, of course, is a central consideration of the new materialism. To borrow from John Protevi, the new materialisms argue against deterministic or reductionist views in which matter (or indeed information, or anything else), is ‘the sole source of order’.[[95]](#footnote-95)

Information is clearly one important source of order but what are the implications of a renewed attention to the ontology of information in studies of informational conflict? I briefly discuss two examples of existing work that takes the ontology of information seriously and outline the implications for the understanding and prosecution of informational conflict. The two sources could not be more different—the first from the heart of the US defence establishment, the second from avowedly critical IR scholars—yet there is much resonance between the two.

RAND Corporation defence academics John Arquilla and David Ronfeldt are notable in developing the proposition that information ‘may be a physical property—as physical as mass and energy, and inherent in all matter’.[[96]](#footnote-96) Although they do not examine this thesis in great detail, they examine its import for conceptualising and operationalizing conflict. If information is physical, they suggest, it becomes something akin to matter and energy, which can be ‘hurled’ against the enemy: success in conflict comes from ‘targeting whatever represents or embodies the most information on an enemy’s side’.[[97]](#footnote-97) As all physical systems embody information, these targets are not restricted to intangible code or ideas alone, but to weapons systems, physical resources, and ‘the most information-rich components of an adversary’s order of battle’, whatever those may be.[[98]](#footnote-98) Viewed from this perspective, although informational conflict is often dependent upon computer networks for its enaction and propagation, its potential targets are much more varied, and informational conflict assemblages more heterogeneous still. Arquilla and Ronfeldt state that as information becomes more material, power, ‘long thought to be based mainly on material resources, is increasingly seen to be fundamentally immaterial, even metaphysical in nature’.[[99]](#footnote-99) At the heart of their proposed military revolution is an understanding that ‘information is a bigger, deeper concept than traditionally presumed, and should be treated as a basic, underlying and overarching dynamic of all theory and practice about warfare in the information age’.[[100]](#footnote-100)

Michael Dillon and his collaborators often cite Arquilla and Ronfeldt, and it is in their work that we find statements like, ‘Information is the new metaphysic of power’, informed explicitly by the line of military thinking described above.[[101]](#footnote-101) Broadening their thesis, and drawing substantially on Foucauldian biopolitics and non-linear science alike, they connect digital code with biological code beneath an informational umbrella that becomes the ways and means of power itself. When power becomes informational, ‘This does not simply mean that it operates through digitised and integrated computer-mediated communication and surveillance technologies. Information is now regarded as the principle of formation of life instead’.[[102]](#footnote-102) The informationalisation of life and its manifestation in manipulable code provide new modes and targets of political intervention, particularly with respect to war and ‘security’.[[103]](#footnote-103)

Both sets of authors engage with the ontological status of information in a metaphysical register and demonstrate its importance for conceptualisations of politics, security and war. These are materialist interpretations of reality that wrestle with the materiality of information itself and propose the cosmos or ‘life’ (it) as emergent from information (bit). If we are, in Floridi’s phrase, informational organisms (inforgs), conflicts will arise over the information that comprises our bodies and which circulates through the material and immaterial facets of our human existence, and IR cannot but pay attention to the ontology of information. The current preoccupations with ‘cyber war’, ‘cyber terrorism’ and so on are but the more lurid symptoms of a deeper ‘re-ontologization’ of our world and our views of the conflicts within it. Informational conflict assemblages are much more heterogeneous and are comprised of many more types of actors (human and non-human) than we might previously have supposed. Informational conflicts may arise in any locus where information exists; that is to say, almost anywhere, given conditions in which one party perceives the actual or imminent frustration of their political interests by another through informational means. If information is constitutive of physical reality, it may be subject to conflict at any ontological level we care to select. The diversification of ‘information warfare’ into multiple new categories noted earlier is but an early illustration of the likely splintering of informational conflict into myriad types across sociomaterial assemblages of shifting form and allegiance. The boundaries between public and private, state and non-state, citizen and combatant, are blurred and reconfigured in conflicts that, borrowing once more from Martin Libicki, might be characterised as ‘non-obvious’, both in the ambiguity inherent in identifying the participants and in ascertaining the identity of the conflict itself.[[104]](#footnote-104)

# Conclusion

The situation may still pertain in which ‘any attempt to confront the materiality of information, especially when that means human knowledge, is met with an executioner’s welcome’.[[105]](#footnote-105) I would hope this is not the case, as the sciences from which social scientists have long taken inspiration have much to offer us with respect to the nature of information. This paper has suggested some ways in which the new materialisms might begin to renew their acquaintance with the problem of information, drawing upon the natural sciences (in particular, physics) and the philosophy of information. I make no claim to resolve the metaphysical status of information, nor indeed do I think this is currently possible. However, I follow Jackson’s advice in attempting ‘to *foreground* ontological concerns, not *re-ground* the field on some particular ontological basis’.[[106]](#footnote-106) I agree with Althusser that materialism might be ‘no more than a temporarily convenient label and that its aim might be to engender a certain sensitivity—a theoretical practice—rather than to define an ontology as such’.[[107]](#footnote-107) This is a sound basis on which to continue our studies, rather than commit to an orthodoxy barely formed, or attempt to generalise irresponsibly. The fledgling yet energetic condition of the new materialisms means that they are well placed to address issues like ‘information’ and to apply their findings to phenomena of contemporary importance such as the various forms of political action I have grouped together clumsily as ‘informational conflict’. The present materialist inattention to information is almost certainly a sin of omission rather than commission but there remains a challenge that can be expressed as a simple question: Information matters for conflict; does it matter for materialism?

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5. Ibid., 4. [↑](#footnote-ref-5)
6. Not least through its subsequent additional back-formation from the science-fiction neologism, ‘cyberspace’. See the discussion in Tom Boellstorff, *Coming of Age in Second Life: An Anthropologist Explores the Virtually Human* (Princeton: Princeton University Press, 2008), 19-20. [↑](#footnote-ref-6)
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61. Jonathan Schaffer, ‘Is There a Fundamental Level?’, *Noûs* 37, no. 3 (2003): 498-517. [↑](#footnote-ref-61)
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81. Floridi, *Philosophy of Information*, 320. [↑](#footnote-ref-81)
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Barbour\_Wheeler.pdf](http://www.fqxi.org/data/essay-contest-files/Barbour_Wheeler.pdf). This would also seem to be Latour’s position, although argued from an entirely different perspective; see, Geert Lovink and Pit Schultz, ‘There is No Information, Only Transformation: An Interview with Bruno Latour’, in *Uncanny Networks: Dialogues with the Virtual Intelligentsia* (Cambridge: MIT Press, 2002), 154-160. [↑](#footnote-ref-86)
87. N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999). See also, Michael Heim, *The Metaphysics of Virtual Reality* (New York: Oxford University Press, 1993); Albert Borgmann, *Holding Onto Reality: The Nature of Information at the Turn of the Millennium* (Chicago: University of Chicago Press, 1999). [↑](#footnote-ref-87)
88. Hayles, *How We Became Posthuman*, 5. Her later work explicitly aligns itself with the pancomputational hypothesis: N. Katherine Hayles, *My Mother Was a Computer: Digital Subjects and Literary Texts* (Chicago: University of Chicago Press, 2005). [↑](#footnote-ref-88)
89. John Smith and Chris Jenks, ‘Complexity, Ecology and the Materiality of Information’, *Theory, Culture and Society* 22, no. 5 (2005): 158. [↑](#footnote-ref-89)
90. In the sense that ‘Metaphysical ideas belong to scientific research as crucially important regulative ideas’; Joseph Agassi, ‘The Nature of Scientific Problems and Their Roots in Metaphysics’, in *Critical Approaches to Science and Philosophy*, ed. Mario Bunge (New Brunswick: Transaction Publishers, 1999), 193. [↑](#footnote-ref-90)
91. Geoffrey L. Herrera, ‘Technology and International Systems’, *Millennium* 32, no. 3 (2003): 559-593. [↑](#footnote-ref-91)
92. See, for example, the review of such definitions in Daniel T. Kuehl, ‘From Cyberspace to Cyberpower: Defining the Problem’, in *Cyberpower*, eds. Kramer et al, 24-42. [↑](#footnote-ref-92)
93. Floridi, *Philosophy of Information*, 317-319. [↑](#footnote-ref-93)
94. Paul M. Leonardi and Stephen R. Barley, ‘Materiality and Change: Challenges to Building Better Theory about Technology and Organizing’, *Information and Organization* 18, no. 3 (2008): 159-176. [↑](#footnote-ref-94)
95. John Protevi, ‘Ontology, Biology, and History of Affect’, in *Speculative Turn*, eds. Bryant et al, 399. [↑](#footnote-ref-95)
96. John Arquilla and David Ronfeldt, ‘Information, Power, and Grand Strategy: In Athena’s Camp—Section 1’, in *In Athena’s Camp: Preparing for Conflict in the Information Age*, eds. John Arquilla and David Ronfeldt (Santa Monica: RAND Corporation, 1997), 145. ‘Physical’ is to be understood in this context as that which is subject to the laws of nature. [↑](#footnote-ref-96)
97. Ibid., 158. [↑](#footnote-ref-97)
98. Ibid., 158-159. [↑](#footnote-ref-98)
99. Ibid., 142. [↑](#footnote-ref-99)
100. Ibid., 154. [↑](#footnote-ref-100)
101. Michael Dillon and Julian Reid, ‘Global Liberal Governance: Biopolitics, Security and War’, *Millennium* 30, no. 1 (2001): 59; Michael Dillon, ‘Network Society, Network-Centric Warfare and the State of Emergency’, *Theory, Culture and Society* 19, no. 4 (2002): 73. [↑](#footnote-ref-101)
102. Dillon and Reid, ‘Global Liberal Governance’, 59; Michael Dillon and Luis Lobo-Guerrero, ‘The Biopolitical Imaginary of Species-Being’, *Theory, Culture and Society* 26, no. 1 (2009): 1-23. [↑](#footnote-ref-102)
103. Michael Dillon, ‘Virtual Security: A Life Science of (Dis)order’, *Millennium* 32, no. 3 (2003): 531-558; Michael Dillon, ‘Intelligence Incarnate: Martial Corporeality in the Digital Age’, *Body and Society* 9, no. 4 (2003): 123-147; Michael Dillon and Julian Reid, *The Liberal Way of War: Killing to Make Life Live* (London: Routledge, 2009), esp. ch. 6. [↑](#footnote-ref-103)
104. Martin C. Libicki, ‘The Specter of Non-Obvious Warfare’, *Strategic Studies Quarterly* 6, no. 3 (2012): 88-101. [↑](#footnote-ref-104)
105. John Smith and Chris Jenks, *Qualitative Complexity: Ecology, Cognitive Processes and the Re-emergence of Structures in Post-Humanist Social Theory* (Abingdon: Routledge, 2006), 95. [↑](#footnote-ref-105)
106. Jackson, *Conduct of Inquiry*, 38, original emphases. [↑](#footnote-ref-106)
107. Louis Althusser, *Philosophy of the Encounter: Later Writings, 1978-1987*, eds. François Matheron and Oliver Corpet (London: Verso, 2006), cited inCoole and Frost, ‘Introducing the New Materialisms’, 35. [↑](#footnote-ref-107)