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Re-Conceiving Information Studies: A Quantum Approach

Abstract: This presentation is a suggestion for rethinking future inquiry in information studies. Features of quantum theory, including examining information and informing action as non-local, dynamic, and time-reversible allow for a departure from existing intellectual constraints. The result desired would be a renaissance in the examination of complex processes, examination not limited by past materialist, instrumentalist, and static conceptions.

Résumé : Cette communication propose une nouvelle façon de penser un questionnement futur en science de l'information. Des notions de théorie quantique, y compris examiner l'information et éclairer les interventions dans une optique non locale, dynamique et réversible permettent de s'éloigner des contraintes intellectuelles actuelles. Le résultat souhaité serait une renaissance de l'examen de processus complexes, non limité aux anciennes conceptions matérialistes, instrumentalistes et statiques.

This paper will address certain complexities that affect knowledge in all disciplines and how information mirrors that complexity. Specifically, the quantum elements of what can be known about anything—and what can be said, as informing statements—will be explored. The word "quantum" is a problematic one, since it was originally conceived within a revision of the discipline of physics. More recently it has been appropriated by a number of fields, so there is indeed a challenge to define it within the domain of information studies. That said, "information studies" is likewise problematic because it resides in a variety of fields, even as it may be intended to imply an intellectual and practical consistency. For the purposes of examination here the theoretical construct of the domain of information is that proposed by Budd (forthcoming). The construct is a realist one, so any potentially competing anti-realist philosophical stances (such as those offered by Michael Dummett (1978)) are rejected. The stance adopted here does not mean that information is limited to the purely or merely physical (that is, information is not limited to material existence), any more than consciousness is merely brain activity. To be more specific, the quantum aspect of information is intended to designate information—in its totality as a communicative, meaningful, human action—as (among other things) non-local, dynamic, and potentially reversible in time. These kinds of features illustrate a departure from any static conception of what information—as it imbues human being—is. They present opportunities for an expanded kind of inquiry into the complex communicative nature of informing processes.

The definition of a quantum structure of information is likely not without its skeptics. The elements of quantum existence (the word "state" is to be avoided since, as is the case in physics, dynamical existence precludes a single, determinate state) must be more clearly explicated. "Non-local" indicates that information does not designate a single being nor an

absence of an ontic basis. Baltag and Smets (2008) observe that there can be "no 'knowledge' without things to be known, no 'information' without an underlying 'formation' (p. 190). In physics, Bell's (1964) theorem, as it applies in physics, proves that there can be no limitation to the local that is consistent with quantum mechanics. The theorem as such does not have the same direct application to information studies as it does to matter and energy, but its conceptualization does. Baltag and Smets (2008) point out how it does have pertinence in our field: "information-gathering actions performed on one part of a large system may have ontic side-effects on other, far-away parts of the system" (p. 208). Those who have inquired into the social, political, and cultural sides of information gathering have demonstrated the pertinence without connecting their work directly to the quantum nature of information and informing.

The dynamical aspect of information may be the least controversial part of this re-conception of information studies. It also is most closely connected with the quantum movement in physics. At the very least, this dynamical element is related to what Prigogine (1994) has called the probabilistic movement that began in physics in the early nineteenth century. Information, within the theoretical construct that features meaning, is not determinate, even as a particular physical or material expression appears to be fixed (such as in the instances of books, journal articles, and the like). There is a sort of Heisenbergian correlate in information studies: one cannot determine an extant epistemic and an extant ontic existence simultaneously. That is, knowledge and being are not necessarily the same, even as they are connected to one another. If information can produce ontic effects across a system, then there is a dilemma when it comes to assessing the two characteristics at the same time. Suppose one is listening to a lecture. The event exists in a particular place. Nonetheless, one may be epistemically transported to knowledge one already has and is relating that knowledge to what the lecturer is saying. In short, one is in an epistemically dynamic plane of existence; it is changing at a rate that, not only is rapid, but cannot be measured in (Newtonian) space. Also, the plane of epistemic existence occupied by one person may not be the same as the one occupied by someone else.

The characteristic of information being reversible in time is akin to the idea of quantum movement in space. The non-diversifiable definition of space-time is a gift from Einstein. Suppose one is reading a book or a journal article. That material object refers to the work and ideas of those who have gone before (citation analysis can be one method by which one might gain a purchase on the complexity of the time-reversible feature of information). In part, it is by this feature that knowledge bases grow and progress. Also, the cognitive actions of recollection, memory, substitution (as in replacing one kind or bit of understanding with another), connection, etc. are time-reversible. Furthermore, the actions depend on the "formations" that Baltag and Smets speak of. There may be the temptation to equate the feature described here with Buckland's (1991) idea of "information-as-process," but that idea is insufficient to capture the complexity of a quantum conception of information *in toto*. Process implies an energy and a direction that have limited probabilistic dynamics, and limited possibilities for assessment.

There are several purposes behind the development of a revised conceptualization of information studies. One (and possibly the most important one) is the purpose of ontological categorization of speech. "Speech" here is defined very broadly as the communicative actions undertaken by humans for all uses. Thus, speech is employed here in the tradition of Austin

(1962), Searle (1969) and others, even admitting some challenges, especially of Austin's work. [N.B.: Care should be taken in exploring all of the possible purposes; information studies is not what Whitehead (1978) would call a "special science." Information studies is at the disciplinary and intellectual level of "family" rather than "genus," as Whitehead places the special sciences. The special sciences can say nothing beyond their genus, but information studies seeks to make statements about all genera.] Something *can* be learned from Whitehead (1978); there are actual entities that are ontologically real and, as such, have reasons. Additionally, "Each actual entity is analysable [sic] in an indefinable number of ways. In some modes of analysis the component elements are more abstract than in other modes of analysis" (p. 19). Categorization and classification can be approached in several other ways that are consistent with the quantum dynamics noted here. Among others, Aristotle, Edmund Husserl, Michel Foucault, and David Woodruff Smith have proffered ideas of ontological organization.

Seeking, retrieving, and using information also lend themselves to investigation according to the quantum model. The study of these phenomena could have been conducted in the past as well as the present. As writers began employing tools such as footnotes information had taken on non-local and time reversible characteristics. Again, researchers have examined information behavior with a tacit inclusion of quantum dynamics, but there has been no explicit conceptualization of the kinds of complexity that has been theorized in physics. [The mention of physics here is not intended to recall the efforts in the nineteenth century to create a "positive science."] If someone searches a database or a library's catalog, what is retrieved is locatable in time and, simultaneously, timeless. Also, any specific item contains the past within the future (and this is much more complex than saying that the natural sciences are informationally cumulative).

The presentation will explicate the nature of quantum characteristics that apply to information, theoretical implications of those characteristics, and possibilities for inquiry in information studies. Again, at the heart of the investigation is not so much the acceptance that information is physical, but that information is *real* (something "that depends neither on our knowledge, nor on what we decide to measure, although it influences the results of our measurements" (Norris, 1998, p. 414).

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