The Occasional Informationist

irregular thoughts on the information sciences

Still awaiting the quantum turn

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Two years ago a paper by myself and my colleagues Lyn Robinson and Tyabba Siddiqui (https://hcommons.org/deposits/item/hc:14697) was published in JASIST, introducing and explaining the idea of an emerging 'quantum information science'. We argued that this could be seen in five respects: use of loose analogies and metaphors between concepts in quantum physics and library/information science; use of quantum concepts and formalisms in information retrieval; use of quantum concepts and formalisms in studying meaning and concepts; development of quantum social science, in areas adjacent to information science; and qualitative application of quantum concepts in the information disciplines themselves. This post discusses some developments since that paper was written.

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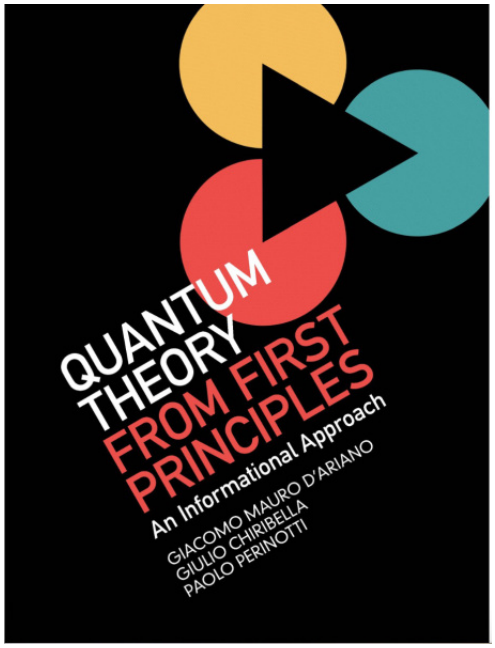
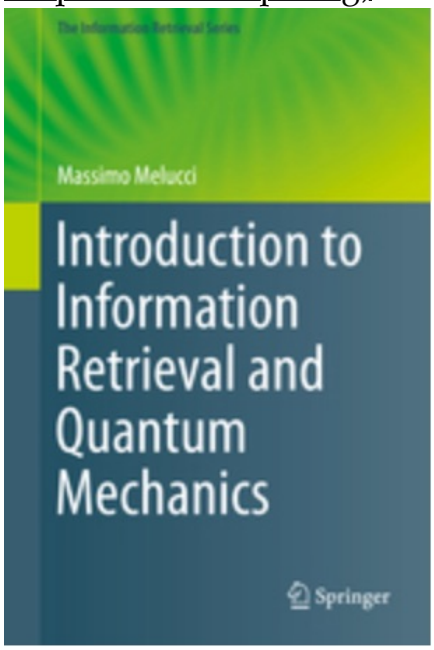


Interest in the links between quantum theory and information continues. In the physics arena, an intriguing attempt is being made to construct the whole formalism of quantum mechanics on information-theoretic principles, as set out by D'Ariano, Chiribella and Perinotti in their new Quantum theory from first principles: an informational approach (http://www.cambridge.org/gb/academic/subjects/physics/quantum-physics-quantum-information-and-quantum-computation/quantum-theory-first-principles-informational-approach?format=HB#qplcPXpKr72L4t86.97). A similar attempt is being made by the proponents of 'QBism' (Quantum Bayesianism) (http://fqxi.org/community/articles/display/218), or 'participatory realism', according to which any the result of any quantum measurement will depend on the information possessed by the observer. Quantum computers are getting near the stage of demonstrating their practical utility, as shown by the stated intention of Google's quantum computer team to produce, by the end of 2017, a small quantum device able to deal with problems previously the preserve of supercomputers (http://spectrum.ieee.org/computing/hardware/google-plans-to-demonstrate-the-supremacy-

of-quantum-computing).



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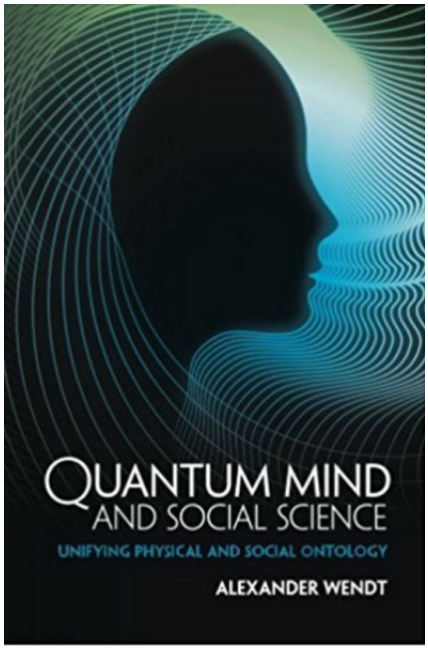
In the application of quantum formalisms applied to information retrieval, a book by Massimo Melucci (http://www.springer.com/gp/book/9783662483121), several of whose papers were discussed in our JASIST paper, summarises the state of the art. He states particularly clearly the way in which the quantum ideas are applied: "The idea behind the quantum-like approach to disciplines of than physics is that, although the quantum properties exhibited by particles such as photons cannot be exhibited by macroscopic objects, some phenomena can be described by the language or have some characteristics of the phenomena (e.g. superposition or entanglement) described by the quantum mechanical framework in physics … This book is not about quantum phenomena in IR: in contrast, it aims to propose the use of the mathematical language of the quantum mechanical framework for describing the mode of action of a retrieval system" (pp viii and xi).

At a more general level, the idea of "quantum informational structural realism" (QISR) has caused some interest since it was introduced by Terrell Ward Bynum (https://arxiv.org/abs/1303.6007). An extension of "Information Structural Realism", first proposed by Luciano Floridi, this provides a full ontological account of the universe in which there is an observer-independent reality, whose ultimate nature is neither physical or mental, but informational, and defined by the interactions between informational entities. QSIR insists that these entities have quantum properties. Betsy Van der Veer Martens was kind enough to note (https://www.ideals.illinois.edu/bitstream/handle/2142/89831/63.3.van-der-veer-martens.pdf?sequence=2) that this "links intriguingly" with the idea of a quantum turn in information studies identified in our JASIST paper (https://theoccasionalinformationist.com/?attachment_id=1501)
In the area of 'quantum social science', there has been one major contribution since the JASTST paper appeared. Alexander Wendt in his book Quantum mind and social science: unifying physical and social ontology



(http://www.cambridge.org/gb/academic/subjects/philosophy/philosophy-social-

science/quantum-mind-and-social-science-unifying-physical-and-social-ontology?format=PB#wsXYj9gLREpgIti4.97) starts from the idea of consciousness as a quantum phenomenon on the macro-scale, and uses it to argue that language, social interaction, and culture should be regarded also as quantum in nature, and hence that a quantum approach is of direct relevance to social science. Wave functions are real, and operate at the social level. However, the arguments seem, like some of those reviewed in our JASIST paper, to be essentially metaphorical. In an interview (https://mershoncenter.osu.edu/news/mershon-news/q-and-a-alexander-wendt-on-quantum-mind-and-social-science.html), Wendt, noting that he was influenced to think about the topic by Zohar and Marshall's popular book, The Quantum Society, gives an example of what he considers quantum effects in social science. He considers a Vietnamese tourist in Denmark going into a shop. The tourist speaks no Danish, and the shopkeeper no Vietnamese; but if they discover that they have English as a common language, then their minds will, Wendt suggests, become "entangled" in a quantum sense. One has to say that this is not the sense of entanglement which would be understood by a physicist. Nonetheless, this book is symptomatic of a potential quantum turn in social science generally, which has clear relevance to the information sciences.

We may conclude that quantum concepts still intrigue and influence the social sciences, including the information sciences, but that no new paradigm has been accepted. The information retrieval applications of the mathematical formalisms of quantum mechanics seems most firmly grounded; claims of true quantum phenomena in settings are as yet un-evidenced, and the metaphorical use of terminology, though increasingly popular, has yet to show real benefit. Perhaps we need to wait for a new formulation of quantum mechanics in informational terms to emerge from physics and be fully accepted, before the quantum turn in information science can be realised; it may be that QISR is the first indicator of this.

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