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Really Big Questions, and the meaning of documentation

In memoriam John Archibald Wheeler (1911-2008)

Professor John Wheeler, who died on April 13 2008 at the age of 86, was one of the giants of twentieth century theoretical physics. He was often coupled, in terms of reputation, with Robert Oppenheim and Edward Teller, with whom he played an important role in the 'Manhattan Project', which developed the first atom bomb. He collaborated with many leading physicists: with Bohr on the 1930s on nuclear physics, with Einstein in the 1950s on relativity and gravitation, and more recently with Stephen Hawking with whom he authored a number of books. Wheeler coined the phrase 'black hole' and proposed for the first time the idea of the 'quantum computer'; both among the most important ideas of late twentieth century physics. He maintained a particular interest in the development of quantum theory, and in the philosophy of this sometimes seemingly mystical subject.

The relevance of Wheeler's distinguished career in physics to the information sciences stems from his focus on the foundations of physics, leading him to formulate what he terms his 'Really Big Questions'. Some of these are indeed expansive: 'How come existence', for example, and 'why the quantum'. [For an detailing and wide-ranging account of Wheeler's ideas, see the contribution in the volume edited by Barrow, Davies and Harper 2004.)

Two of his questions, however, involve information and meaning in the most direct way possible. In asking 'It from bit?', Wheeler queried whether information was a concept playing a significant role at the foundations of physics; whether it was a fundamental physical entity, equivalent to, say, energy. Indeed, he divided his own intellectual career into three phases: from a starting belief that "Everything is particles", he moved through a view that "Everything is fields", to finally conclude that "Everything is information" (Princeton 2008).

In asking 'What makes "meaning"?', he invoked the idea of a 'participatory universe, in which conscious beings may play an active role in determining the nature of the physical universe. In his speculations on these topics, Wheeler essentially pioneered the ideas of 'information physics', and provided ideas of linkage between the concepts of information and meaning as they are understood in the various branches of science which include them as useful concepts.

The validity of this linkage, and the value of considering a unified view of information in different realms of scholarship, is by no means universally agreed; see, for example, Hj34rland for a counter-argument. But those who see a value in considering such an approach [see, for example. Bawden 2007, Bates 2005 and Stonier 1990] owe a great intellectual debt to John Wheeler, the extent of which only become clear in decades to come.

David Bawden

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