

The Nature and Meaning of *Information* in Biology, Psychology, Culture, and Physics

1. Introduction

Information and information processing, like air and breathing, are so pervasive and essential that we rarely notice or fully appreciate them. There are so many levels, types, and interactions for information processing that it is extremely difficult to grasp the full implications.

Concepts involving information play an increasing role in some of the most challenging problems in science. Two of the most profound mysteries in science are how life began and how quantum physics should be conceptualized. There are strong arguments that concepts of information will have a fundamental role in understanding these mysteries (Greenstein & Zajonc, 2006; Schlosshauer, 2007; Yockey, 2005).

However, the relevant writings reveal differing concepts, terminology, and assumptions in discussing information in different branches of science and technology. These differences result in ambiguities and inconsistencies that hinder scientific understanding, particularly on a much-needed interdisciplinary level. For example, the different uses and implications of the term information in biology and physics are not widely appreciated.

The purpose of this paper is to summarize the concepts pertaining to information as these concepts are emerging in scientific research and to identify fundamental concepts, properties, and distinctions that are applicable throughout the wide spectrum of uses of the term information. This discussion may provide a basis for interdisciplinary insights about life, consciousness, creativity, and quantum physics.

The initial version of this paper was prepared as an online work in progress in 2012 to 2014. In 2023 I looked at more recent writings about information to update the paper. However, the newer writings basically re-stated the same ideas, ambiguities, inconsistencies, and debates as described in 2014 without contributing significant new insights or integration. Therefore, this paper is the version from 2014 with a few clarifications.

References

- Greenstein, G., & Zajonc, A.G. (2006). *The Quantum Challenge: Modern Research on the Foundations of Quantum Mechanics* (2nd ed.). Sudbury, MA: Jones and Bartlett.
- Schlosshauer, M. (2007). *Decoherence and the Quantum-to-Classical Transition*. Berlin, Germany: Springer.

Yockey, H.P. (2005). *Information Theory, Evolution, and the Origin of Life*. New York: Cambridge University Press.

Next Section: [2. What is Information?](#)

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