A CRITIQUE OF THE MEASURE OF INFORMATION

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The paper focuses on the generally accepted identity between the Boltzmann-Plank formula for physical entropy and the Shannon formula of the theory of communications.

The first part traces the various terminological mutations of the term "information" from the earliest work by H. Nyquist (1924) to the present practice, denounced by C. E. Shannon (1956) as a "bandwagon phenomenon". On a strict connection with the notion of information as generally understood there is only one possible way to arrive at some measure of information, namely, to unite the original idea of Nyquist (adopted by most other contributors on the subject) with the notion of surprise as conceived by G. L. S. Shackle. However, this approach is limited to a specific framework, namely, that a finite number of events occurring with a known probability distribution.

The foregoing point is completed by the proof that the discrete formula of Plank cannot be extanded by a passage to the limit to the continuous formula used by Boltzmann in the Theory of Gas and proposed by Wiener as a measure of information (1948). It is further shown that these formulae are only particular instances in a class of statistics that offer a pseudomeasure of uniformity (alternatively, of concentration in a sense different from that covered by variance or standard deviation). The main properties of these general formulae are presented and proved.

In the last part, it is argued that, whatever formula is used, its numerical value cannot represent a measure of information in the sense proposed above. Examples of such misuses from the literature will illustrate the argument. With a still greater logical force one must reject the reversible equivalence which has been claimed to exist in actuality between the information involved in a scientific discovery and the negentropy consumed by the process that led to that discovery.