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Wiener's Insight into Communication

Not being a mathematician, most of the ideas and insights for which Norbert Wiener was to become famous lay outside my reach. But Wiener had a universal mind and broke through traditional preconceptions in many fields. As Donald MacKay wrote in his tribute 30 years ago: "He was helping to establish and make articulate a new habit of thought" [1].

One of the disciplines for which Wiener's work on communication provided a new way of thinking was the study of language. He not only articulated a revolutionary idea in one clear sentence: "The message, to convey information, must represent a choice from among possible messages"[2, p,202)], but he also illustrated it by a wonderfully simple example:

If I send one of those elaborate Christmas or birthday messages favored by our telegraph companies, containing a large amount of sentimental verbiage coded in terms of a number from one to one hundred, then the amount of information which I am sending is to be measured by the choice among the hundred alternatives, and has nothing to do with the length of the transcribed "message." [2, p.202)]

I read this in 1963 while setting up a research project in computational linguistics that was based on semantic analysis rather than traditional syntax or transformational grammar. The meaning of words and linguistic expressions, I had learned from Silvio Ceccato [3], could be considered a matter of conceptual structures that each language user had to construct by means of mental operations. Wiener's example was the first and for a long time the only corroboration of this view that came from outside our own group.

The notion that a message is "a sequence of measurable events distributed in time"[4, p.8] and that the *information* it carries is a selectional indication that allows the receiver to pick one of a pre-established set of alternative meanings, was a revelation which, I ingenuously thought, would at once revolutionize the traditional conception of linguistic communication. Wiener's example showed so convincingly that it is not *meaning* that travels in a communication channel, but signals that cannot be interpreted except by receivers who are in possession of the particular code. Yet, the traditional habit of thought was not relinquished, and the relevant literature continued to bolster the belief that meanings are *contained* in words and *transmitted* by speech or writing.

Wiener, as far as I know, did not raise the question of how children acquire the code that enables them to interpret their language. However, he explained the principle in the case of adults who have no language in common. The semantic connection between signals and their meaning can be formed only by the mutual

observation of actions and reactions. That is to say, language is learned by the individual's abstraction from interactions with other language users. Meanings, therefore, remain anchored in individual experience. This underlies Wiener's conclusion: "Certainly no information available to the individual is also available to the race unless it modifies the behavior of one individual to another"[4, p.157].

Philosophers, in the wake of Wittgenstein's later work, are now coming round to this view. Hence there is hope that some of the other seminal, non-mathematical insights Wiener articulated half a century ago may become established and eventually credited to him.

Notes

1. MacKay, D.M. "Norbert Wiener 'Catalytic Irritant'"; *J.of Nervous and Mental Disease* , Vol.140 No,1, 1965, 9–10.
2. Wiener, N. "Time, Communication, and the Nervous System"; *Annals of the New York Academy of Sciences* , Vol.50, 1948, 197–219.
3. In 1958, Silvio Ceccato founded the Center for Cyber-netics and Language Analysis in Milan.
4. Wiener, N. *Cybernetics* ; M.I.T.Press (paperback), 1965.
