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# On the Cybernetics of Time

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## ON THE CYBERNETICS OF TIME

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In describing communication as a process, reference to time is indispensable. Elsewhere I argued that it is easy to pay lipservice to this notion but quite a different matter to design studies, collect data and construct theories involving time. One reason is that in communication -- the process of transmitting structure between systems -- time is at least a third-order abstraction. Communication involves first, a difference in states, second, a difference in systems within each of which distinctions of the first kind are made, and third, a difference in time which changes in states of one system are followed by changes in states of another.

In communication research, much of our thinking seems to be based on a mechanical conception of time, as measured by a clock, segmenting time into equal intervals, and progressing from the past into the future without a clear beginning and without a clear end. Theories incorporating this time concept are essentially, of the form:

$$y_t = f(x_{t-i})$$

in which  $y$  follows  $x$  after a fixed time interval,  $i$ . Numerous methods of analysis, markov processes and sequential machines, for example, make this assumption.

There is of course some justification for this interval concept. At least since the industrial revolution we increasingly live by time tables, work sequences, appointment calendars and now TV schedules. The only option we seem to have is to

choose between several assembly lines. I believe this time concept is peculiar to our western technology-dominated culture. In some cultures time is circular, in others it has a definite origin and/or a definite end. And there is psychological evidence that the perception of time is influenced by the quantity of information to which individuals are exposed. Time is far from being a settled issue.

One ought to extend this prevailing conception to include other orders in time. For example, many processes of growth and of decay are essentially of the form:

$$y_t = f(x_0, t)$$

in which  $y$  depends on the initial state of  $x$  and the absolute time elapsed between them. There probably are good reasons why this ratio conception has not lent itself to good communication theories.

The more appealing time conception is ordinal:

$$y \leftarrow f(x)$$

where the arrow designates  $y$  as the successor of  $x$  without implying a time interval along which they differ. Numerous social processes are of this kind. To receive a research grant one has to apply. To apply one has to have a signed proposal. To get the signatures on a proposal one has to have certain qualifications, certifications, facilities, etc. which in turn may have been acquired a long time ago. Many organizational pro-

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cesses work on ordinal time and it is surprising that communication theories and research methods rarely recognize this. A notable exception is Anatol Holt's approach (which was presented at the 1977 Berlin ICA conference).

From the very beginning of cybernetics, the idea of circularity played a major role. The notion of feedback as the closing arc of a circle that a communicator thought to have initiated is familiar. But cybernetics is also committed to the idea that a whole system cannot be analysed into its parts without due concern for its organization, the dynamic relationship between parts. Feedback constitutes only a special solution for the general problem of self-reference (which logical-empiricists systematically avoided);

$$x' + f(x)$$

When communication sets a whole chain of events in motion which ultimately turns back on its origin, then it is difficult to identify a prime mover. All individuals involved contribute to this flow and each modifies his own self by this circularity. The proper unit of analysis is not the individual--individuals merely provide each other the context for self-realization--and not the information. Such units require a circular simultaneous understanding. And to analyse or synthesize larger wholes with complex information flows in these terms requires novel ways of using such units as building blocks.

The simultaneous inspection of circular flows also invokes a different concept of time, one in which the linear ordering is radically overcome. Time

has to become a relation between flows of different circularity but shared paths. Circular flows without common paths have their own time and are hence independent. Circular flows involving only one element require no time whatever. In circular flows that overlap or are embedded, time is slowed down, or accelerated and synchronized under conditions of stability. Circular flows involving large numbers or more complex elements retain larger quantities of memory and invoke the idea of different magnitudes of time.-- These are but a few notions of a time concept incompatible with current thinking.

Gregory Bateson, Humberto Maturana, Francisco Varela among others, are breaking ground for a radically different time concept. It is bound to enlarge the repertoire of building blocks for theory construction in communication and to negatively affect the validity of many of our current investigative tools. It should make us think differently.

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