CHAPTER 2

INFORMATION AND LANGUAGE

In this chapter the strategy of the isolable subsystem is followed out in an attempt to find a body of verbal behavior suitable for linguistic analysis beyond the syntactic level. The result, the 'Language Automaton', suggests a pragmatic definition of language. The starting point is the concept of an 'information state'.

2.1 INFORMATION STATES

The most important primitive notion of the theory we wish to consider is that of a state of informedness or information state. Because it is a primitive term no precise definition of it can be stated, but some motivating remarks can be made.

What is wanted for the study of information is a conceptual construct of some kind that embodies only the most fundamental objects and operations encountered in dealing with information. Probably the most basic of all notions of this sort is simply the idea of information existing somewhere - that is, of information residing at a certain time in some particular location. This concept of 'stored' information implies the existence of a system in which the information is stored, the system being a physical complex of some sort whose organization or behavior is indicative of the information it embodies. It is this way of thinking about information that gives rise to such locutions as “The information will be available at such-and-such a time and in such-and-such a form.”

There may be other legitimate ways of conceiving information, for example information as it exists in the act of being processed, transformed, or communicated. It seems likely though that these dynamic concepts of information, if definable at all, would be dependent upon the static notion as a prior concept. To process information is to change the form in which it is stored.

Examples of systems often considered to contain stored information include: (a) a library; (b) a hologram; (c) a DNA molecule (conceived as a store of hereditary information); (d) the internal memory of a digital computer; and (e) the human brain. (In example (e), the person of whom the

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information-storing system is a part is said to 'know' or 'believe' the information in question.) Now in order to gain a clear understanding of what stored information is, we must discover what it is that such systems have in common. But what in the world do (a)-(e) have in common?

It would seem that the possible ways of storing information are so diverse that nothing of general applicability can be said about the physical structures involved, or at any rate nothing helpful. If the goal is to find a property general enough to characterize simultaneously all information-bearing structures, the quest seems hopeless. What is needed for a general theory of information, then, is a formulation of the notion of stored information so abstract that it assumes nothing about the particular form the information takes. The only concept that would appear abstract enough is the fundamental notion of a 'state'.

In systems theory the set of possible states a system could be in is called its state set and the state it is actually in at a given moment its current state. Applying these ideas to examples (a)-(e), one finds in each case there is indeed a physical organization potentially capable of being in any of a large number of states, though actually in only one at any given time. One sees too that the state of the system at a given time is what determines the information it is conceived to contain at that time. Knowing its current state is the same as knowing what information is currently stored in it.

To deal abstractly with the concept of stored information we need therefore make only the following frugal assumptions: (i) there is a physical system in which the information is stored; (ii) there is a set of states which the system has the potential of being in; and (iii) at any given time (except possibly during temporary transitional periods) the system is in one and only one of these states. It is assumed that the state set can be specified in such a way that knowledge of the current state is sufficient for determining all the information the system currently contains. We will speak of an information state set and an information state when referring to state sets and states in this connection.

2.2 INPUT AND OUTPUT

What further concepts are needed for the study of information? Well, a capacity for storing information is of no use unless there is some way of getting the information into and out of storage. This suggests that the idea of an information-containing system should be supplemented by the auxiliary notions of input and output.