Psychologie en cybernetica. Een leertheoretische verkenning
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SUMMARY

This book must be considered as an attempt to develop a model in which the human being is seen as a complex hierarchically structured control system. This has been done before (Miller, Galanter and Pribram 1960 and others). The notion that the human being functions as a control system consisting of higher and lower ordered units can be found in many models. However the distinction, well known in psychology, between cognitive and automatic actions is hardly ever taken into account. In the model discussed here this omission has been rectified. The system in the conception presented here consists of two main parts, a cognitive system and a subordinate automatic system. Our main objective was to try to answer the question as to the functions of these two systems within the whole.

The cognitive system is characterized as follows. First, the system is able to control actions of the whole system on the basis of aims. These aims are derived from an inner model of the outer world (comprising the functioning of the automatic system). Second, the system is able to develop such a model on its own by dealing with the outer world. Third, the system programs the automatic system. This means that the cognitive system has an orientational function within the whole system.

The automatic system on the other hand only has an executive function. That is, it controls the course of actions, but it cannot select aims on its own. The programs controlling the course of actions do not exist in the automatic system from the very beginning. Most of the programs come into existence at a later stage when new actions are executed, first under cognitive control and later automatized (the cognitive control then partially disappears).

We tried to demonstrate and to specify the functioning of the whole system on the basis of empirical data from the fields of psychology (perception, motor actions, attention and learning) and physiology. We paid special attention to problems of the acquisition of inner representations or cognitive structures, which enable the cognitive system to control the course of events in the outer world (and the automatic system).

At this moment we need much more empirical data about the course of learning processes, in order to get more information about the development and the character of inner representations. An exact description of the development and the features of these representations is called for so as to specify the functioning and the interaction of the two systems. An interdisciplinary approach to the problem will be necessary. The exploration of the functioning of the automatic system in our opinion belongs to the field of physiology. The modern automaton theory in cybernetics may also be rather helpful in constructing models of both the cognitive system and the automatic system. However we must be very cautious of the latter before we know more about the organizational prin-
Our own experiments lie in the field of foreign language learning. We are specially interested in the acquisition of pronunciation, the lexicon and grammatical structures as well as in the interrelations between these learning processes. The results obtained indicated that these learning processes are very different in character, but are not completely independent in their course. The native tongue competence and the way the pupils analyse products of speech in the foreign language very likely have an influence on the development and the features of inner representations. It proved possible to manipulate the course of learning processes by teaching methods. We found that each of the three learning processes comprise different subordinate processes (e.g. on the aspects of form and on the aspects of meaning at the three language levels). The inner representations are of various types and develop in different ways through a number of stages.

Altogether it seems that during the learning process of a foreign language a system of inner representations is formed, that as a whole and in its different parts is inserted into the existing model of the outer world. We think it safe to claim that in psychology many specific learning processes must be studied separately and in their relation to others and for longer periods than is usual in laboratory experiments before we are able to state anything really substantial about learning.