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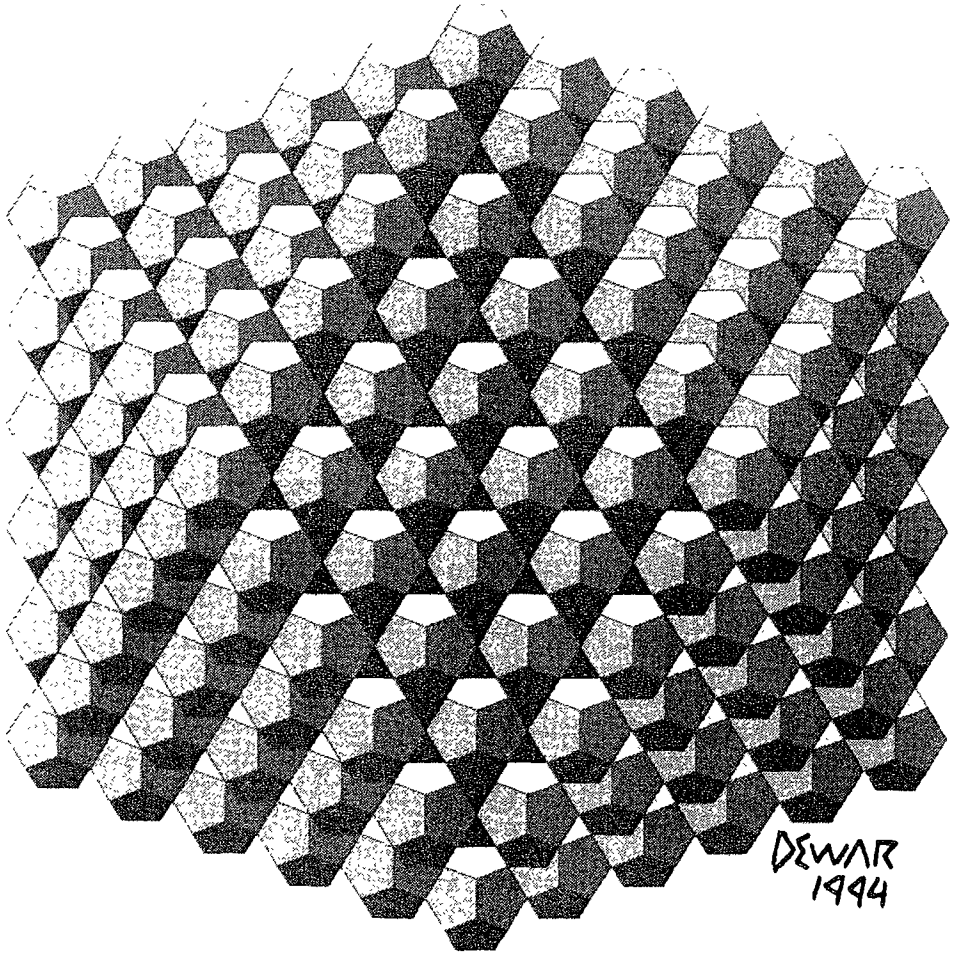

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TEACHING EXPERIMENTS AS EVIDENCE FOR THE HEMISPHERIC PARADIGM

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1. A HEMISPHERIC MODEL

According to Levy-Agresti & Sperry (1968) the brain includes two data processing mechanisms. The first is an analytical mechanism, which is lateralized mainly to the left hemisphere, and processes one datum after another. The second is a synthetical mechanism, which is lateralized mainly to the right, and synthesizes a new whole out of several data. Ben-Dov & Carmon (1976) extended this dichotomy into a multi-stage model of the brain's functioning. According to this model the output of each mechanism is available to the other one as an input. The right hemisphere receives the data analyzed by the left one and synthesizes them into a new whole. This new whole is transmitted to the left hemisphere, where it is processed analytically as a single datum. Thus more and more complicated codes are constructed.

According to this model The same sensory data is available to the two mechanisms. When these data arrive first at the analytical mechanism they are perceived one after another in time. When they arrive first at the synthetical mechanism, they are perceived simultaneously and spatially. Thus a neurological basis for

Kant's a priory modes of perceiving experience, space and time, is obtained. Continuity is defined as the existence of a point between any two points. Since between two consecutive peceptions of objects in time there is no another such perception, time cannot be continuous, and it must be quantisized.

This model implies that high cognitive stuctures are costructed from simpler cognitive structures, and these simpler cognitive structures are costructed from elementary sensory data. Therefore the efficiency of analytical and synthetical perception of data should be related to the efficiency of analytical and synthetical conception of cognitive structures, respectively. Description of experimental testing of this hypothesis follows.

2. EXPERIMENTAL EVIDENCE

The counting of signs apppearing rapidly one after another during dozens of milliseconds (MS) with temporal intermissions of dozens of MS is related to the left hemisphere. On the other hand, the enumeration of dots presented simultaneously during dozens of MS is related to the right hemisphere (Fidelman, 1990). These tests are perceptual and low cognitive, and were applied as hemispheric tests in the experiments described below, in which scores on the learning of high cognitive concepts and the preference of a philosophical view were compared with scores on these tests.

Ordinal numbders, first, second, etc., are properties of single objects perceived one after another temporally. They are abstractions of ordinal perception of objects. We observed that this perception is related to the left hemisphere. Therefore, we

may expect that the undestanding of concepts of ordinal numbers is positively correlated with the left hemispheric test. Cardinal numbers, one, two, etc., are properties of simultaneously perceived sets. We observed that cardinal enumeration of sets presented simultaneously is related to the right hemisphere. Therefore we may expect that undestanding concepts of cardinal arithmetic is related to the right hemisphere. These hypotheses were accepted in experiments with adults and with preschoolers (Fidelman, 1990, 1991, 1995).

A potentially infinite process is a process in which each step has an immediate successor, i.e,, there is no last step. This is an extension of the process of counting ordinal numbers. Therefore, we may expect that the understanding concepts of potential infinity is related to the left hemispheric test. An actually infinite set includes an infinity of simultaneously given elements. These sets are an extension of finite sets, and the infinity of their elements is an extension of the concept of finite cardinal number. Therefore we may expect a relation between our right hemispheric test and actual infinity. These relations between the two hemispheric tests and the two concepts of infinity were found experimentally, see Fidelman (1991).

Nominalism accepts only the existence of analytically perceived objects, while Platonism accepts the existence of properties of sets, i.e., wholes synthesized from objects. The preference of Platonism over nominalism, of Kant's spatial over his temporal mode of perception, and of a continuous approach to physics over

a quantisized approach, are related to the dominance of the right hemisphere over the left one (Fidelman, 1991), as expeted by the model of Ben-Dov & Carmon (1976). This hemispheric dominance is also related to the preference of top-down (starting with comprehensive concepts) over bottom-up (starting with elementary objects and concepts) concept mapping (Thimor & Fidelman, 1995). This too is expected by the model of Ben-Dov & Carmon (1976).

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