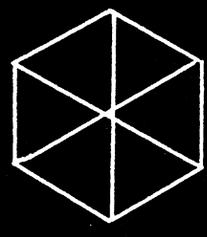

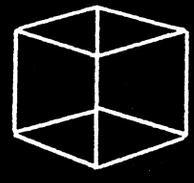

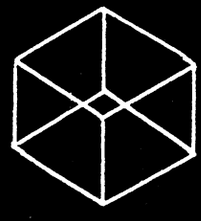

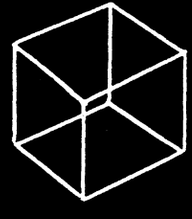

Pattern Perception

AAAS Symposium

29–30 December 1969

Boston

Current research on pattern perception will be presented at a symposium during the AAAS Annual Meeting in Boston. The first session will be held on 29 December (p.m.) and the second session on 30 December (a.m.). The symposium will bring together reports on current work on the perception of visual pattern of both two and three dimensions and on the perception of temporal pattern. Both physiological and behavioral approaches will be represented and one emphasis will be on relating these two kinds of evidence. An additional emphasis will be on new studies of infant and adult response to a variety of geometric forms and on adult response to visual and auditory temporal patterns. A third major concern will be with theoretical interpretations of pattern perception as represented by both information processing and stochastic models.

Microelectrode recording from nerve cells in the visual cortex has shown that some cells are particularly sensitive to certain visual forms, for example, a line at a certain slant. Various types of visual deprivation of neonatal kittens have been found to selectively destroy most of these presumed analyzers or integrators. Such animals find it impossible to learn most form discriminations. However, L. Ganz will report on experiments showing that when a carefully selected sequence of pre-training is used, these monocularly reared cats will slowly learn a very simple form discrimination—such as multiple horizontal versus vertical stripes. In contrast, when monocularly deprived cats initially learn a horizontal versus vertical discrimination with their experienced eye, they transferred the discrimination fairly readily to their deprived eye. This interocular transfer implies these animals actually have a residual of shape analyzers sufficient to mediate pattern recognition which they can use once they have been taught how to use them by training them with their experienced eye. It is conjectured that an essential part of the mechanism of pattern recognition consists of an efferent mechanism that effectively weights the outputs of the analyzing and integrating cells. This feed-forward device must be highly plastic since it is severely affected by monocular deprivation.

P. H. Schiller will present the results of a series of studies of the neural events underlying eye movement and the way in which the perception of visual pattern and oculomotor activity interact. Schiller investigated the activity of single neurons in brain structures involved in oculomotor control. The results of recordings from the frontal eye fields and oculomotor nuclei of the alert, unanesthetized rhesus monkey

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Kopfermann cubes pose serious and as yet unanswered questions for any theory of pattern perception. Why are some seen in two and some in three dimensions? Why out of all the possible three-dimensional interpretations are they usually seen as cubes? Why are some occasionally seen as representations of other three-dimensional objects? How does one explain their reversibility? P. C. Vitz, New York University

Speakers and Topics

Arranged by P. C. Vitz
(New York University)

29 December (afternoon)

Chairman: P. C. Vitz.

Recent Experiments on Pattern Perception, N. S. Sutherland (University of Sussex, England).

Analysis of Pattern Perception through Visual Deprivation, L. Ganz (Stanford University).

Single Unit Analysis of Visuo-Motor Control, P. H. Schiller (Massachusetts Institute of Technology).

Visual Investigation of Geometric Patterns by the One- and Two-Month Old Infant, P. Salapatek (University of Pennsylvania).

30 December (morning)

Chairman: R. N. Haber.

Integration of Responses to Parts of Contour Geometric Form, J. H. McFarland (Antioch College).

A Model of the Perception of Simple Geometric Figures, P. C. Vitz.

Perception and Learning of Temporal Patterns, S. Handel (Kansas State University).

Extraction of Information from Briefly Presented Visual Forms, R. N. Haber (University of Rochester).

will be discussed with special emphasis on their implications for the problem of spatial localization and size constancy.

P. Salapatek will present recent work on the visual investigation of geometric pattern by 1- and 2-month-old infants. Infants between 4 and 10 weeks of age were presented with a variety of plane outline shapes (circle, triangle, square, regular hexagon, and irregular hexagon) and with large outline squares in which small internal pattern features (squares) were embedded. Detailed corneal photographic recordings of eye movements and fixation points were analyzed to describe the general characteristics of the infants' scan and to indicate the temporal selection of pattern features for central visual investigation.

N. S. Sutherland will present his recent research on pattern perception.

J. H. McFarland will discuss the questions: (i) Is a perceived visual form composed of figured units? and (ii) Is there a sequence of responses to figural units composing a perceived form? In one set of studies contour geometric forms (triangles) are presented at a low luminance level. The fragmentation that occurs under these conditions suggests that contour rectilinear forms are composed of line and angle units. When single stimuli from series of angles and lines are presented, the differing rates of disappearance and simple reaction time both within and across series provide a basis for a discussion of similarities and differences between figural units.

Other studies explore parameters affecting a recently described illusion of visual succession. This illusion is generated by flashing two vertical lines near a contour form, one line 100 msec before and the other line 100 msec afterward. Under these conditions the parts of the form appear successively. This illusion is interpreted as indicating that there is a sequence of responses to figural units of a contour form which is typically not apparent in perception.

P. C. Vitz will present a model of human perception of straight-line, two- and three-dimensional geometric figures, for example, triangles, trapezoids, and cubes. The major characteristics of the model are: (i) a figure is represented as a hierarchy of perceptual elements—lines, angles, areas, and volumes, and (ii) the process of perceptually organizing a figure is portrayed as a stochastic sampling of the elements. The model is used to predict the judged complexity of a wide variety of two-dimensional figures; with some additional rationale the model is also used to predict the perceived three-dimensionality of figures such as Necker cubes which can be seen in either two or three dimensions.

S. Handel will report on his findings of how human subjects perceptually organize and learn temporal patterns. The patterns, composed of eight binary elements, were presented in both visual and auditory modalities. The elements of the initial patterns were of equal duration and equally spaced but later the subject was presented with patterns containing additional components, for example, with a tone accented by making it brighter or louder, or by pausing before the first element of the pattern. Still later, rhythms were added to the patterns. Special emphasis is on how these additional important and complicating components affect the pattern organization and rate of identification.

R. N. Haber will discuss research on human processing of briefly presented visual information, for example, letters, and words. The results bear directly on such questions as: the length or the duration of the visual image (that is, of the iconic memory); the time to extract individual items of information; the order of item retrieval; the relation of how serial items are scanned, "read in" to how they are retrieved, or "read out"; the question of serial versus parallel processing; and the general question of how the processing of serial items is ordered.

P. C. VITZ
New York University,
New York City

Program information and registration forms for the meeting, hotels, and tours appear in the 10 October issue of Science. *Reports about symposia appear in the following issues: 19 Sept., "Tektite: A Study of Human Behavior in a Hostile Environment"; 26 Sept., "Expanding Horizons in Medical Education"; 3 Oct., "Education of the Infant and Young Child"; 10 Oct., "Is There An Optimum Level of Population?," "Approaches to Policy Sciences," and "Sea-Level Panama Canal"; 17 Oct., "Quantitative Studies of Urban Problems" and "Our Food Supply"; and 24 Oct., "Physiological Effects of Audible Sound," "Climate and Man," and "Rational Use of Water."*