moving objects having object-character derived from the subject's own experiences. This perception evidently corresponds closely to the experience of a moving object under scotopic conditions.

Under optimal conditions, Beta movement (where the moving stimulus corresponds to the physical stimuli) is reported. Beta and Omega are not reported simultaneously. It is felt that the Omega is isomorphic to a movement signal generated by certain temporal aspects of the recurrent stimulus.

We may formulate a tentative law which states that if an area X' is stimulated some time before an area Y' is stimulated, the necessary condition for the perception of motion alone has been met. Detail vision will be a function of the energy level of the stimulus and its temporal duration. If the detail component is barely above the limen, then the motion signal will capture the detail complex. If the energy level of the stimulus is raised, the detail component will register isomorphic to the real space projection of the stimulus, but the temporal conditions necessary to generate the motion signal need not be violated.

The detail component is thus related to the energy level or contrast relationships of the stimulus and ground, whereas the motion component is related to the timing or subjective velocity of traverse of the visual field. Obviously, such organic characteristics as delay time and adaptation act to interrelate the two components.

The foregoing formulation is a restatement of Korte's laws of apparent motion extended to include the case of all perceived motion. It will serve to relate real motion perception, the phenomena of apparent motion, and certain observed perceptual changes in moving objects.

We postulate two neural organizations, one primitive organization, which corresponds to motion perception, and another, isomorphic to detail. The more primitive motion perception mechanism is similar to scotopic vision. It is also more resistant to disruption, so that the detail complex may cease to be associated with the motion signal. If the necessary conditions of successive stimulation of retinal areas is maintained, the perception of Beta motion will break apart into the detail complex and the motion signal.

In this case, we expect the temporal ordering of the stimulus to be the largest single factor in determining motion perception, since the Omega is largely a function of timing, whereas the detail component tends to lose significance at a level barely above the limen. If the energy or contrast level is raised, it merely reflects more detail and will eventually come to anchor the perception of the stimulus object to its real location in space.

When the spatiotemporal aspect of a stimulus configuration duplicates the necessary condition for the motion complex, the assignment of object character to the movement perception arises out of the proximity of the source of energy necessary to create the motion signal. Each component can be isolated and studied under laboratory conditions. Does this mean that we have succeeded in isolating the components of a perceptual organization, or does it mean that perceptual organizations are holistic but tend to combine in a nonlinear manner to form new organizations? Certainly logic will not predict Beta movement from the motion complex and an object in the visual field. Perception is thus removed to a supraordinate level.

Perception of Omega is the perception of a dynamic signal stating that "something has moved" from X to Y. It is entirely distinct from the organization of neural elements which transduce the static physical characteristics of the stimulus object. The supraordinate process combines the two organizations into a new item of intelligence: the moving object is an object in the spatial field.

References and Notes

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Communications

Induction of Tooth Defects by Thermal Shock

The large increase in incidence of tooth decay in the United States since the turn of the century has undoubtedly considerable connection with our changed eating habits. One of the changes in eating habits is that of eating intensely cold and hot foods at the same meal. The practice, for example, of eating piping hot food, served at say 150°F, and a moment later taking a swallow of an iced drink, or vice versa, exposes the teeth to some thermal shock. One effect of thermal shocks on vitreous materials is to induce small cracks, which accelerate mechanical breakdown. In the case of teeth such small cracks could also furnish entrance sites for bacterial decay. How important is such thermal shock to the teeth?

To obtain a preliminary idea of how to attack the problem, a number of extracted healthy teeth free of fillings were subjected to repeated thermal shock, then subjected to a smashing action. A comparison was then made of the proportion of the teeth that survived the smashing with the proportion of teeth surviving that had not undergone thermal shock cycling. The test conditions chosen were extremely simple but severe and were intended only to indicate probable trends in tooth behavior.

From the original batch of 160 teeth, half were selected by a random manner as controls and half were subjected to 72 thermal shock cycles. The 80 teeth to be shocked were placed in a wire basket and alternately shifted from boiling water to ice water containing much finely cracked ice. Emphasis was placed on producing rapid temperature change in the teeth. The teeth were allowed to come to temperature and after 1 min were transferred rapidly to the other temperature bath. The control teeth were boiled for 3/4 hr but were heated and cooled slowly to avoid thermal shock. A test was then made of the resistance of the two groups of teeth to fracturing. After sacrificing a few teeth to explore suitable crushing tests, a final comparison of the teeth was begun. A flat-bottomed 6-lb lead weight block was dropped from a height of 7 in. onto individual teeth as they lay on a hard concrete floor. The drop tests were done in alternating groups of 10 teeth from each large group. Of the control group, 11 out of the 50 broke; of the group given the 72 shock cycles, 21 of the 50 tested broke. The results suggest that thermal shock may promote cracks in teeth. Further work on this aspect of dental effects is indicated.

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Trisomics in Barley

To date relatively few reports have been published on trisomics in common barley, *Hordeum aesitivum* Hall. ($2n = 14$). In his comprehensive review "Cytology and genetics of barley," Luther Smith [*Botan. Rev.* 17, 1 (1951)] cites only three references dealing with trisomics. A series of trisomics would be extremely valuable in cytogenetic studies of barley. So far none of the seven linkage groups has been definitely identified with a particular chromosome. By means of trisomic inheritance studies, it should be possible to associate genes and linkage groups with specific chromosomes.

Trisomic plants were found in the progeny of three triploid barley plants obtained in the F_2 of intervarietal colchicine-treated F_1 hybrids. The parents of triploid 453-11 were an awnless and a hulless type of an unknown variety name, while triploids 1963-4 and 2223-5 were from a cross between Wong and Herta. Except for partial sterility, the triploids resembled normal diploid sibs in general morphological characters. One triploid was found in the progeny of an F_1 plant that also produced diploids and tetraploids. It probably originated from the union of a haploid with a diploid gamete of the same plant. The other two triploids were found in the progeny of different F_1 plants in which no tetraploids were observed. They were probably derived from intercrossing of wholly diploid plants with plants having tetraploid tillers, since the treated generation was grown in confined greenhouse beds.

Table 1. Fertility of triploids.

Triploid plant	No. of florets	No. of seeds	Fertility (%)
453-11	155	15	9.7
1963-4	509	63	12.4
2223-5	360	41	11.4
Total	1024	119	Avg. 11.6

The fertility of the triploids under open pollination in the field is given in Table 1. A total of 119 seeds was produced for an average fertility of 11.6 percent. Table 2 gives the chromosome constitution of 25 mature plants obtained from 61 of the 119 seeds sown in pots in the greenhouse. Nine diploids, 13 trisomics, and three other chromosomal variants were cytologically identified. The latter three plants included one with 14 chromosomes and a large centric fragment capable of forming a heteromorphic trivalent with two normal homologues, one with 15 chromosomes and an acentric fragment, and a third plant with 16 chromosomes. Since the 16-chromosome plant was identified by mitotic counts of somatic anther tissue, it was not possible to determine whether it was doubly trisomic or tetrasomic.

All trisomic plants and the three other variants were partially self-fertile. The fertility of the trisomics, including a few heads pollinated with normal pollen of diploids, ranged from 20.4 to 66.7 percent. The fertility of the three plants having 14 chromosomes and a centric fragment, 15 chromosomes and an acentric fragment, and 16 chromosomes was 50.7, 37.6, and 23.7 percent, respectively.

Since the trisomic plants were derived from highly heterozygous material, it was not possible to attribute any morphological characteristics to the trisomic condition. However, it is possible that one or more constant morphological characteristics will be observed in the trisomic progeny of the original trisomic plants that are presently being grown in the field. Positive identification of the chromosome involved in each of the trisomic lines may be possible by one or a combination of the following methods: (i) study the morphology of the mitotic chromosome complement of each trisomic line; (ii) backcross each trisomic line to a pure diploid in order to attain homozygosity and then observe the phenotypic effects of the extra chromosome; (iii) cross each homozygous line to the

Table 2. Chromosomal constitution of triploid progeny.

Triploid plant	No. of seeds sown	No. of mature plants		
		Diploid	Trisomic	Other
453-11	11	0	0	0
1963-4	33	8	7	1
2223-5	17	1	6	2
Total	61	9	13	3