whereas color perception is a function of both the discrete retinal cell excited and its cortical ending, color mixing need not take place in the cortex. That this statement implies a much wider range of color receptors than is postulated by the Young-Helmholtz theory is not denied.

The cortical projection plane is viewed as a construct which has some psychological validity. It is isomorphic to real space and is a field composed of cell assemblies and matrices in varying degrees of excitation, but it is not a uniform field, since there is some evidence for the existence of two organized processes which are both actually isomorphic to some distant area xy. Stimulation of areas x' and y' results in an outward spreading of excitation by virtue of the mechanisms postulated earlier. In the case of apparent motion, this spreading outward may, if continued, result in the excitation of areas which are psychospatially isomorphic to the distant area xy. Under proper repetitive conditions matrices similar to those activated by the distant stimulus may participate in an organization which will be the psychological reproduction of the distant stimulus. If the distant stimuli are congruent in all qualities, the end process is one of apparent motion, since there is now an excitation for the area isomorphic to distant area xy. Hence there is a sensory-sensory transfer of an entire organized process. This statement is supported by the fact that, if the distant stimuli are covered by congruent 1-mm grids, the entire grid pattern is transferred as an integral part of the Beta motion. The Beta object differs somewhat in the degree of resolution, indicating either some nonlinearity in the transmission network or difficulty in experimental procedure.

There is apparently a correlation between the decay time of a matrix so activated and the rate of stimulation necessary to produce optimal motion. All existing calculations, including those given by Wertheimer (*1*), approximate the normal alpha rhythm. (It has been observed that optimal motion is better if the distance and size as well as the intensity of the stimulus are optimized with regard to a repetition rate of 4–12 serial flashes/sec.) Time constants involved also agree closely with those determined for Gamma motion.

The entire process bears a close resemblance to the problem of measurement in general, there being considerable evidence for the operation of an uncertainty principle. If the speed of the apparent motion is reduced, the complex breaks down into extreme detail (alternation) without motion. Under these conditions the distant stimulus can be described in minute detail. In the range of repetition wherein optimal motion is found, some motion as well as some detail can be measured. If the speed of motion is increased sufficiently, a new phenomenon is found to appear. This motion has been called Omega movement. It is similar to Phi, except that in general "etwas" is present. Observers report well-organized movement of "something" which is best described as a moving shadow, without detail but possessing withal considerable thing quality. It is then operationally something in motion, not just pure motion without something moving, but with a lack of detail.

In conclusion it may be stated that the examination of the processes of apparent motion has revealed evidence for the lateral transfer of complete sensory organizations, as well as some experimental evidence for the existence of processes which have been called coexistent. If it is possible to transfer an organization which is dependent upon direct sensory input, there is little reason to doubt the existence of the simultaneous transfer of other processes both sensory-sensory and sensory-association. If a concept can exist as an encoded matrix and can be so transferred, we can lay the foundation for a psychological theory of relationships and discrimination based on a vector-sum theory of the comparison of two perceptual organizations by the fusion resulting from the encoding of two such organizations in coexistent matrices where the previous organization of the physiological system is of such a nature that neither matrix will be favored. It is believed that this theory may have implications with regard to both conditioning and learning theory as well as perceptual organization.

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Inhibition of Tobacco Mosaic Virus Biosynthesis by 2-Thiopyrimidines[1]

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We have previously reported that thiouracil, an analog of uracil, inhibits tobacco mosaic virus (TMV) formation in tobacco leaf tissue (*1*). These studies have been extended to a series of purine and pyrimidine derivatives.

Experimental material consisted of tobacco leaf discs inoculated with purified TMV and cultured in nutrient according to a method previously described (*1*). The TMV content of the discs at various times after inoculation was determined by the method of Commoner *et al.* (*2*). Results are reported as percentage of inhibition at the time at which untreated inoculated tissue contains a maximal amount of TMV (260 hr after inoculation).

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Four uracil derivatives (5-bromouracil, 6-hydroxyuracil, 6-methyl-2-thiouracil and 6-propyl-2-thiouracil) gave no inhibition in concentrations up to 10^{-3} *M*. Substances which are effective inhibitors are listed in Table 1. Inhibitory effectiveness appears to be a common characteristic of the 2-thiopyrimidines, although 2-thiothymine is somewhat less active than the uracil and cytosine derivatives. Two purine analogs, 2,6-diaminopurine and 8-azaguanine (5-amino-7-hydroxy-1H-v-triazolo [d] pyrimidine), which have been found to inhibit virus multiplication (*3–5*), are less effective than the thiopyrimidines. The results with 8-azaguanine confirm the observations of Mathews (*5*), who showed that this substance reduces the number of local lesions formed by lucerne mosaic virus-inoculated leaves of *N. glutinosa*.

TABLE 1

PYRIMIDINE AND PURINE DERIVATIVES THAT INHIBIT TOBACCO MOSAIC VIRUS SYNTHESIS

Compound	Concentration (*M*)	Percentage inhibition
2-Thiouracil	10^{-4}	90–100
2-Thiocytosine	10^{-4}	90–100
2-Thiothymine	10^{-3}	90–100
2,6-Diamino purine	10^{-4}	80
8-Azaguanine	10^{-3}	60

In order to ascertain the point of attack of the thiopyrimidines, attempts were made to reverse their inhibitory effect by adding uracil, cytosine, and thymine to the nutrient medium. It was found that of these natural nitrogen bases, only uracil is capable of suppressing the inhibition that is due to the thiopyrimidines (Table 2). This result suggests that the inhibitory effect of thiocytosine and thiothymine is not due to interference with cytosine and thymine metabolism. On the contrary, the thiopyrimidines appear to have a common point of attack, a process which requires uracil.

These data confirm the earlier conclusion (*1*) that TMV-synthesis is uracil-dependent. The observation that 2,6-diaminopurine inhibits TMV synthesis is in agreement with a recent report by Ryzhkov and Marchenko (*6*). These authors also find that thiouracil is an effective inhibitor and is reversed by uracil.

TABLE 2

EFFECT OF PYRIMIDINES AND THIOPYRIMIDINES ON THE BIOSYNTHESIS OF TOBACCO MOSAIC VIRUS IN TOBACCO LEAF TISSUE

(Virus Present—Percentage of Control)

Concentration (*M*) pyrimidine	Thiouracil $10^{-4}M$	Thiocytosine $10^{-4}M$	Thiothymine $10^{-4}M$
None	7	10	5
10^{-4} Uracil	15	82	37
10^{-3} "	88	140	103
10^{-2} "	88	90	60
10^{-4} Cytosine	3	10	4
10^{-3} "	5	12	5
10^{-2} "	—	15	10
10^{-4} Thymine	3	18	3
10^{-3} "	3	28	4
10^{-2} "	—	33	13

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A Snail Intermediate Host of the Rabbit Parasite *Hasstilesia tricolor* (Trematoda: Brachylaemidae)

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Hasstilesia tricolor (Stiles and Hassal, 1894) is a small fluke frequently found in the small intestine of certain species of rabbits of the genera *Sylvilagus* and *Lepus*. Around Ithaca, an infected rabbit may contain as many as 15,000 flukes, and reports of 30,000–40,000 occur in the literature (*1*). The occurrence of such heavy infections in wild rabbits has led to considerable speculation on the life cycle of this fluke. Several workers have attempted to determine the mode of transmission, and some have suggested that a direct life cycle may exist in this species (*2*). Flannery (*3*) attempted to feed eggs from *H. tricolor* to laboratory rabbits, but was unable to demonstrate direct development. Hendrickson (*4*) and Haugen (*5*) both found the fluke more prevalent in rabbits taken from low, marshy ground, and the latter author indicated that the most severe infections occurred in winter. Harkema (*6*), working in an area which showed a "paucity of fresh water," could find no correlation between type of habitat or season and the number of flukes per rabbit.

The writer has recently found that in the vicinity of Ithaca a small land snail belonging to the genus *Vertigo* serves as the intermediate host of *H. tricolor*. Henry van der Schalie compared the snail with specimens in the University of Michigan Museum of Zoology and provisionally identified it as *Vertigo ventricosa* form *elatior* Sterki. A series of these snails has been placed in the parasitological collection of the Department of Entomology at Cornell University. Of 47 snails collected in one survey area during the summer of 1952, 31 were found to be infected with motile branched sporocysts in various stages of development. Mature sporocysts contained hundreds of spinous,