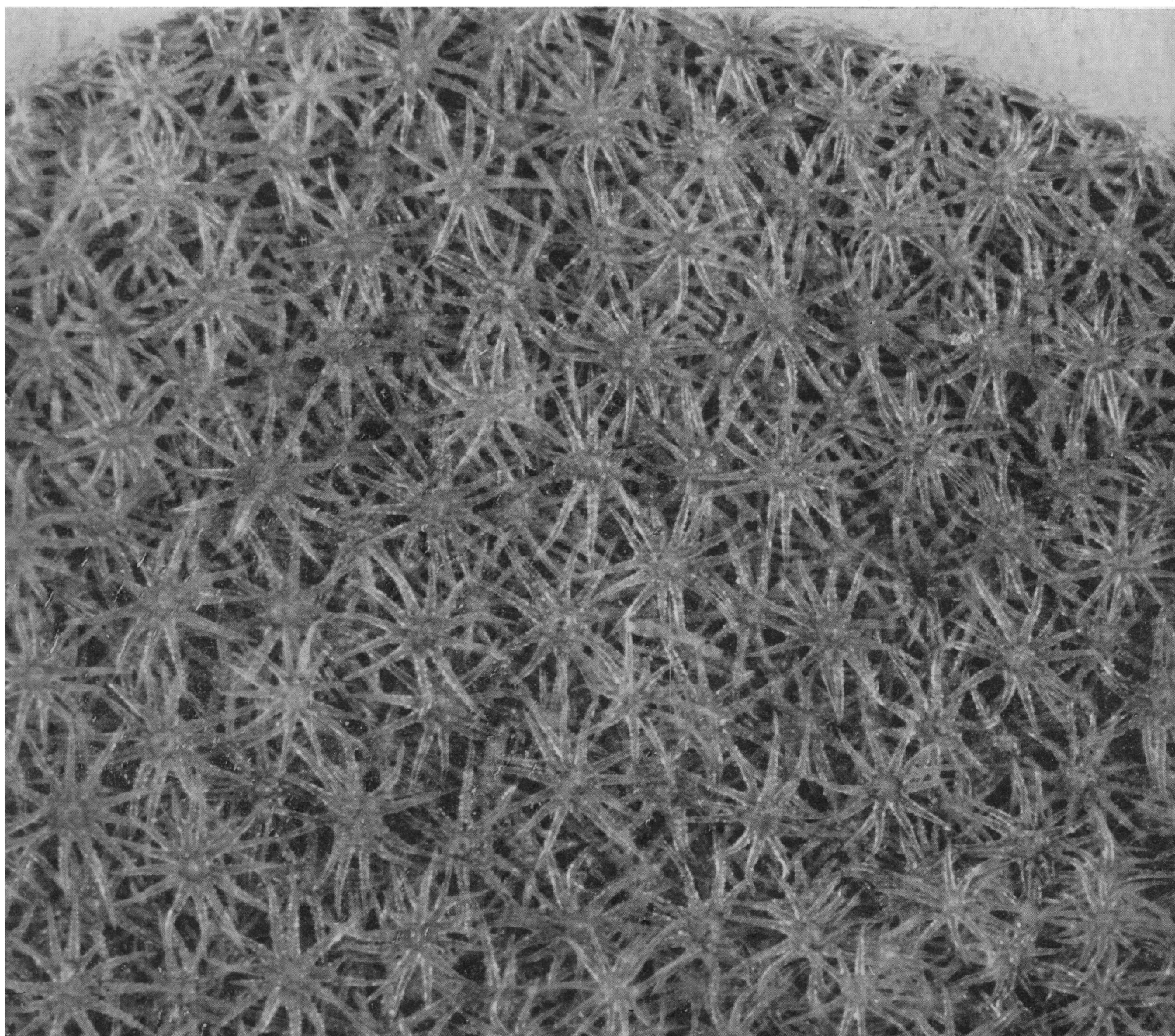


SCIENCE

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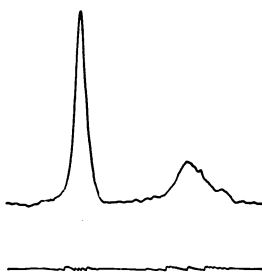
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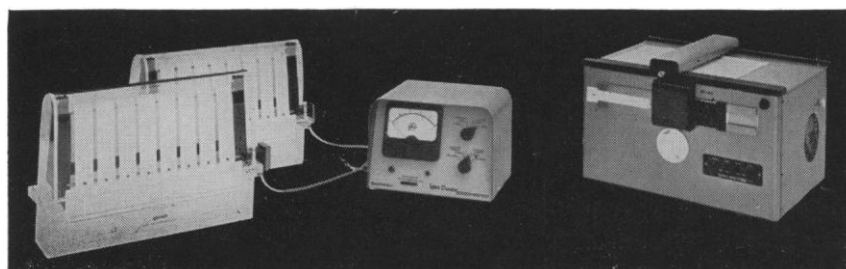
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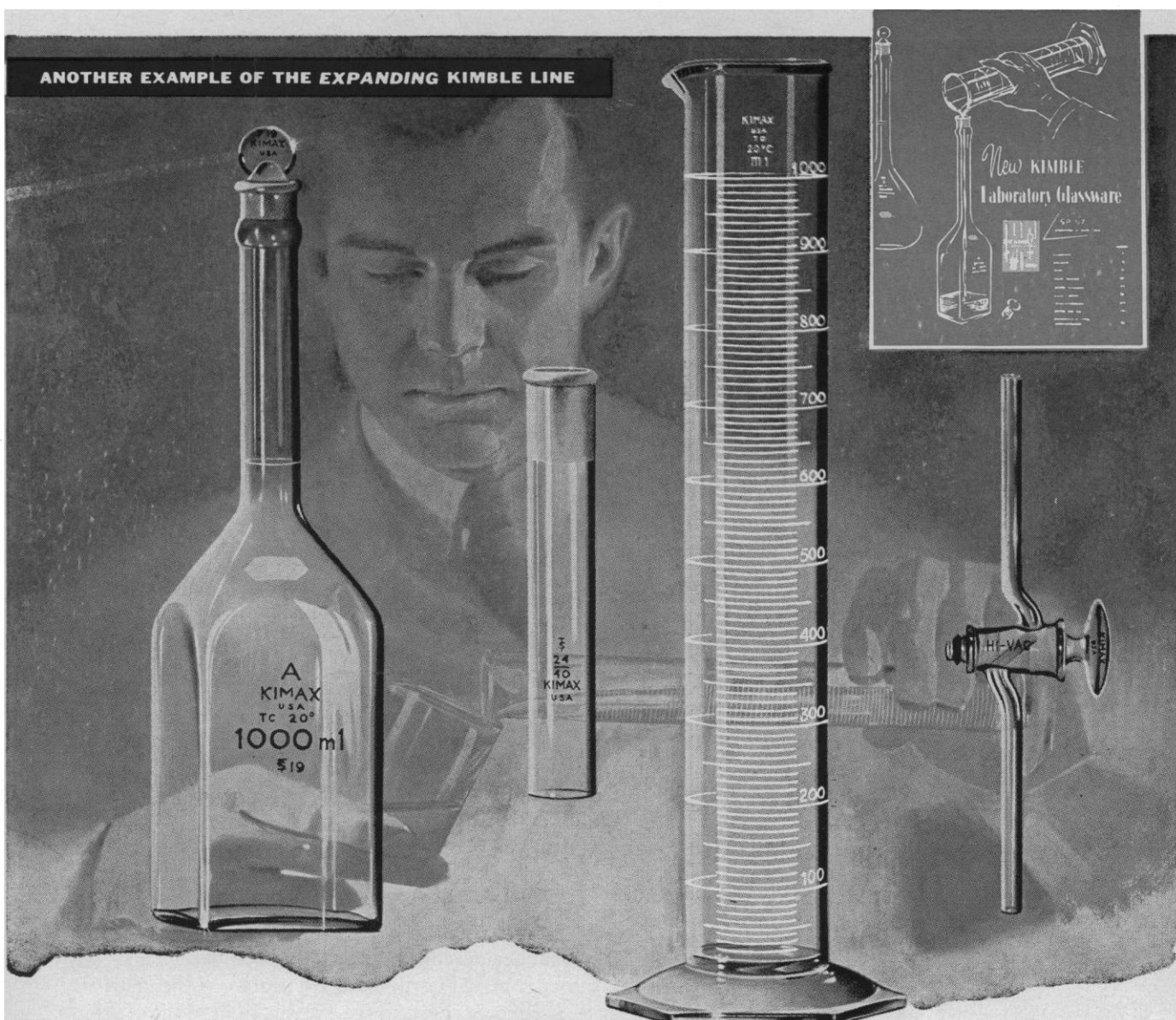
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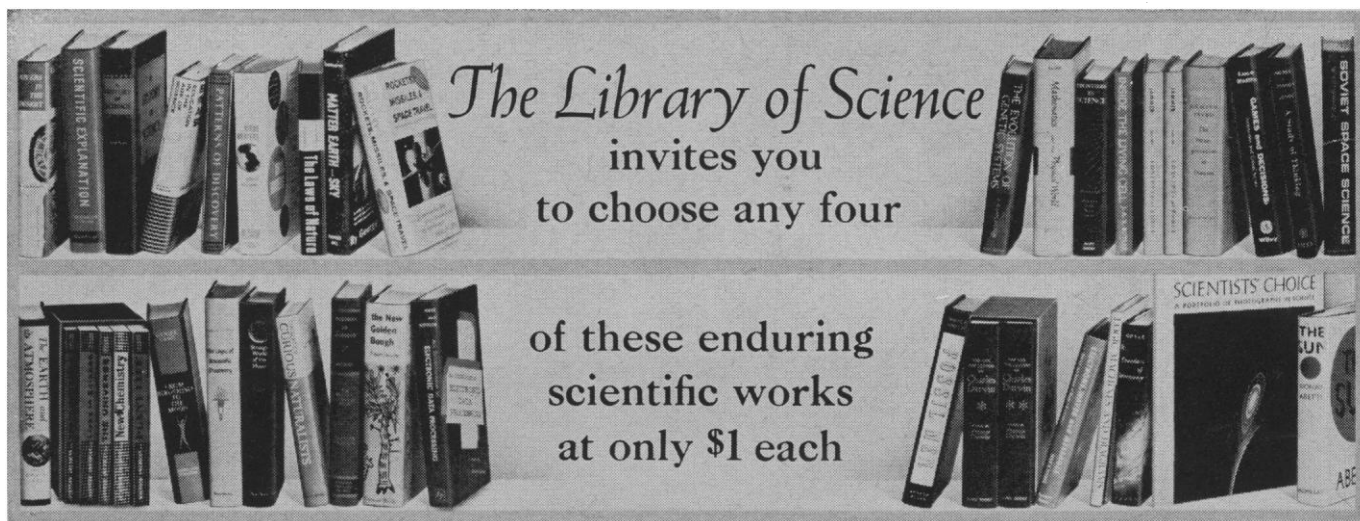
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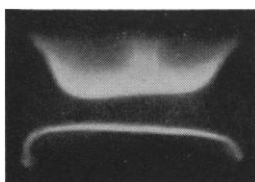
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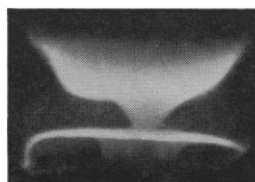
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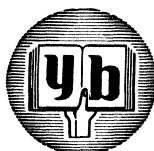
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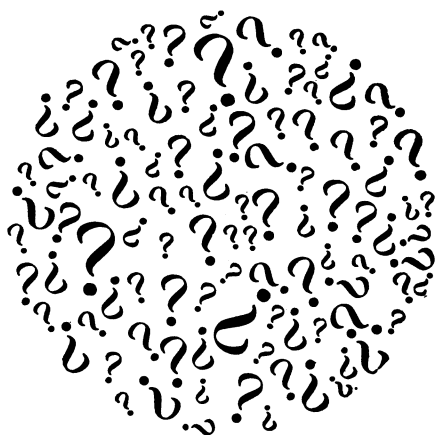
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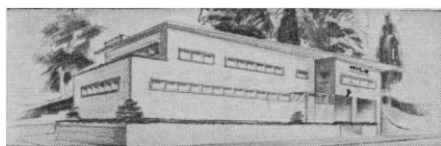
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Letters

The Moon Illusion

In the paper entitled "Magnitude of the moon illusion as a function of the age of the observer" [*Science* **130**, 569 (1959)], H. Leibowitz and T. Hartman stated, "The diminution in the apparent size of an object when viewed overhead as compared with its apparent size in the horizontal plane is greater for children than for adults." They suggested in explanation, "Since children have less experience with distantly viewed objects, especially when viewed directly overhead, the magnitude of the moon illusion is greater the younger the observer." One is not justified, I believe, in assuming that the horizontal "moon" is correctly perceived while the perception of the overhead moon is in error. It is just as reasonable to assume that the size of the overhead "moon" is correctly perceived but the horizontal "moon" is erroneously perceived as being larger than actual size. In this case the explanation of more experience with horizontal objects and therefore better accuracy in judging their size would be contradicted by the experiments of Leibowitz and Hartman.

Furthermore, since some visual cues occurred in these experiments, even in the darkened but not completely dark theater, the explanation of the moon illusion referred to by Thomas Reid seems more credible. "We frequently perceive the distance of objects by means of intervening or contiguous objects, whose distance or magnitude is otherwise known. . . . An object placed upon the top of a high building, appears much less than when placed upon the ground, at the same distance. When it stands upon the ground, the intervening tract of ground serves as a sign of its distance; and the distance, together with the visible magnitude, serves as a sign of its real magnitude. But when the object is placed on high, this sign of its distance is taken away: the remaining signs lead us to place it at a less distance; and this less distance, together with the visible magnitude, becomes the sign of a less real magnitude. Dr. Smith hath observed, very justly, that the known distance of the terrestrial objects which terminate our view, makes that part of the sky which is towards the horizon appear more distant than that which is towards the zenith. Hence it comes to pass, that the apparent figure of the sky is not that of a hemisphere,

but rather a less segment of a sphere. And, hence, likewise, it comes to pass, that the diameter of the sun or moon, or the distance between two fixed stars, seen contiguous to a hill, or to any distant terrestrial object, appears much greater than when no such object strikes the eye at the same time" [T. Reid, *The Works of Thomas Reid, D.D.*, W. Hamilton, Ed. (Longmans, Brown, Green, and Longmans, London, new ed., 1846), sec. 22].

Lastly, the increase of the illusion with distance of the object from the eye may be due to the loss of significant information for depth perception which might ordinarily arise from the ciliary muscles of accommodation. This is reasonable because the adjustments of the ciliary muscles for objects at distances greater than about 30 feet appear to be insignificant.

LEONARD A. COHEN

*Department of Physiology and
Pharmacology, University of Pittsburgh,
Pittsburgh, Pennsylvania*

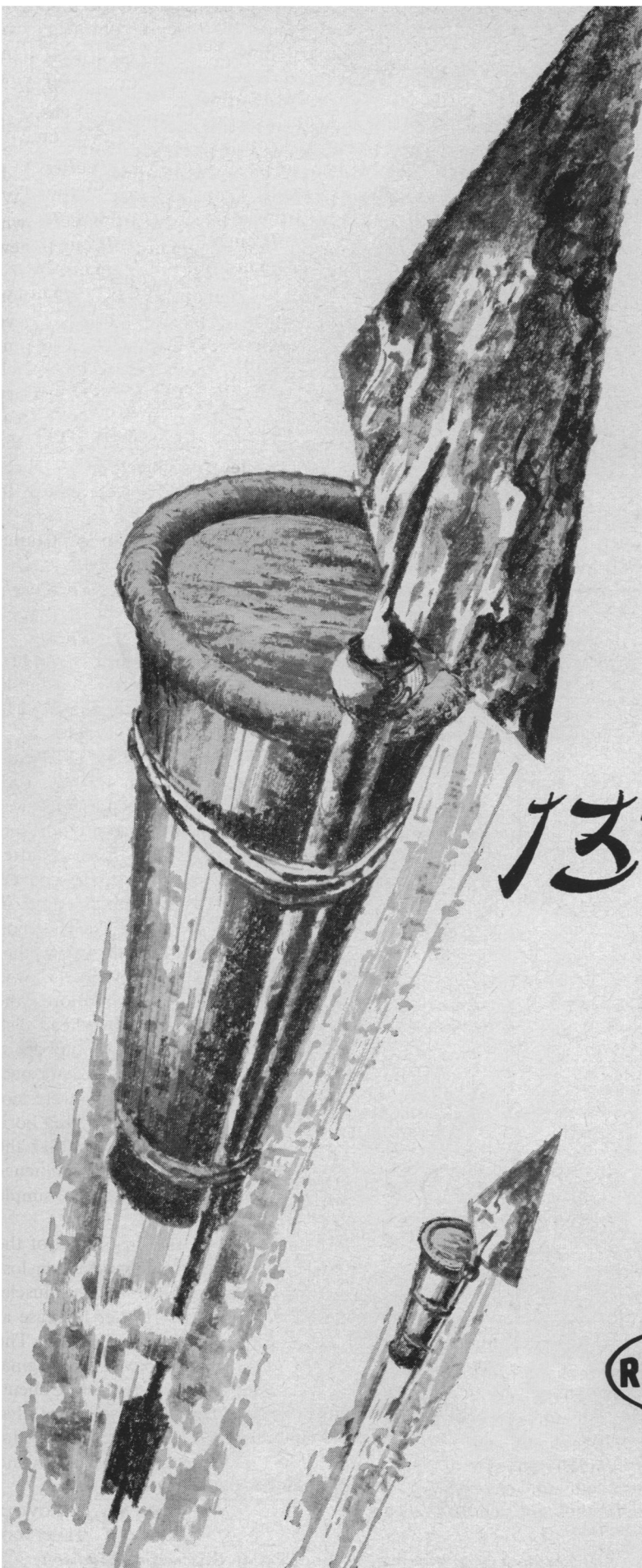
The point raised by Cohen in the first paragraph of his letter has previously been discussed [*Science*, **131**, 238 (1960)].

The point raised by Thomas Reid's explanation is logical but was not supported by the verbal reports of our subjects. Most of them expressed surprise when they were informed, after completion of the testing, that the overhead and horizontal stimuli were in fact at the same distance. Their opinion was that the overhead disk was farther away than the horizontally viewed comparison stimuli. Furthermore, the building from which the overhead disk was supported provided a number of cues to distance—for example, perspective and relative size—which were not present to the same degree for the horizontal stimuli. It would seem that the judgment of distance does not influence size judgments in a direct or simple manner.

If the change in the magnitude of the illusion were directly dependent on loss of information from the ciliary muscle, one would expect no further increase at distances beyond 20 or 30 feet. The data of Schur, referred to in our original article, would argue against Cohen's interpretation, for she discovered that the magnitude of the effect was influenced by variation of distance beyond this point.

H. LEIBOWITZ
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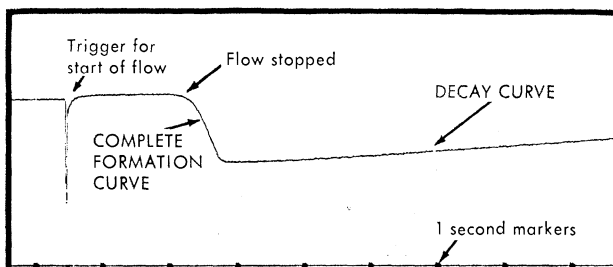


FIGURE 1

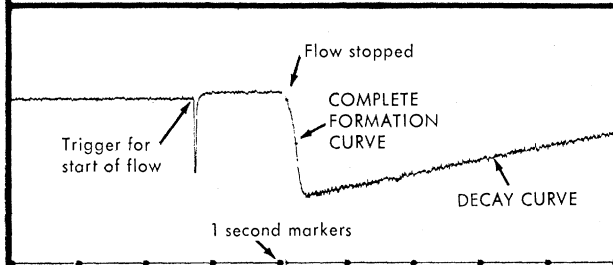


FIGURE 2

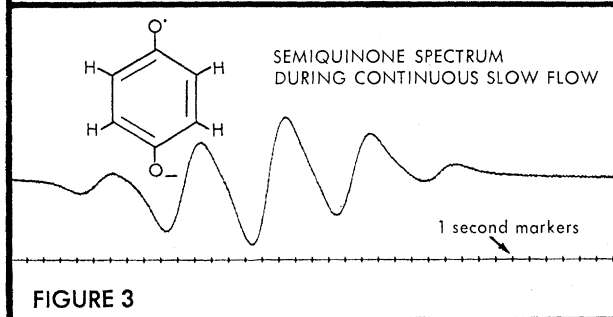


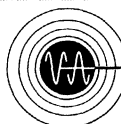
FIGURE 3

In the past, two techniques utilizing EPR have been used to study the kinetics of free-radical reactions. One method involves relating some change in the spectral features of the resonance lines with the rate of the reaction, (i.e. rapid electron exchange reactions), while the second technique uses the EPR spectrometer as a means for monitoring the time rate of change of concentration of free-radical intermediates formed in the reaction. This latter technique has generally been applicable only to very slow reactions, (i.e. half lives of 10-20 minutes).

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Zero Tolerance

At a date still to be set for sometime next month, the House Committee on Interstate and Foreign Commerce will assemble a panel of scientists for hearings on food additives. The use of cancer-inducing substances (carcinogens) as food additives, which has been brought prominently to public attention by the recent cranberry incident and the barring from the market of fowl treated with a synthetic female sex hormone that can induce cancer under laboratory conditions, will undoubtedly be a major issue.

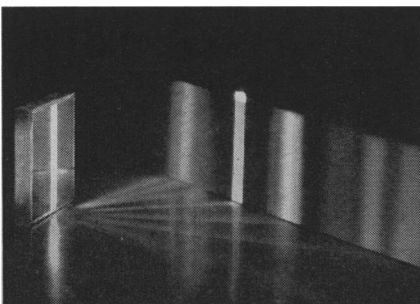
Central to this issue is the controversial "Delaney clause" of the 1958 amendment to the Food, Drug and Cosmetics Act, which prohibits the use as a food additive of any substance that "is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of food additives, to induce cancer in man or animals. . . ." The effect of this clause is to put carcinogens in a different category from that of other toxic substances. For such other substances, tolerances may be established after appropriate testing or on the basis of long experience with their use in foods. But the Delaney clause, as it has been interpreted by Secretary Flemming of the Department of Health, Education, and Welfare, sets a "zero tolerance" for any substance that can be shown to induce cancer when fed to animals in any amounts over any period of time. Opponents of the clause in the food and chemical industries, and many scientists who have no industrial axes to grind, call the clause "unworkable" and "unrealistic." They contend that the clause prevents the exercise of scientific judgment about safe levels of carcinogens in foods.

Those scientists and others who favor the Delaney clause justify putting weak carcinogens—strong carcinogens are not in question—in a special category on several grounds. Weak carcinogens usually take a long time to have an effect, and even then they induce few cancers. Furthermore, in the present state of our knowledge, it is not possible to say with absolute assurance that even a small dose of a weak carcinogen will not initiate irreversible cellular changes that may lead to the formation of cancer in man long after exposure.

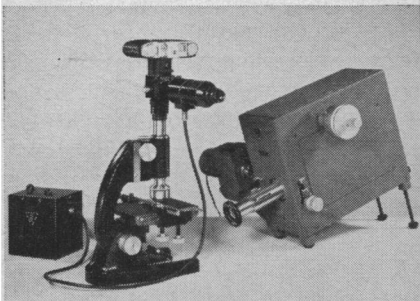
For an ordinary toxic substance, the effects are rapidly manifested and are reversible. Consequently, thresholds of action for an ordinary toxic substance in animals can be readily determined, and the limit for human consumption can be set at some small fraction (1/100 or less) of the no-effect level for the most susceptible animals tested.

For a weak carcinogen, on the other hand, the long latent period and the infrequency of response make the determination of a threshold far more difficult: many more animals must be treated for much longer periods before reasonable estimates of hazards may be made. The task is difficult, but surely not impossible. What is needed is far more systematic animal experimentation with weak carcinogens, administered orally and in amounts that suffice to establish dependable dose-response relations.

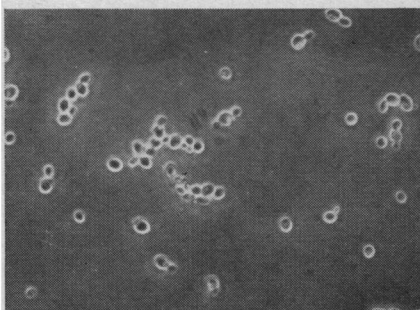
These considerations and others too complex to be considered here will give the scientific panel a difficult job. We hope the panel will be able to suggest the most effective means of bringing scientific judgment to bear upon the provisions of the Delaney clause.—G.DuS.



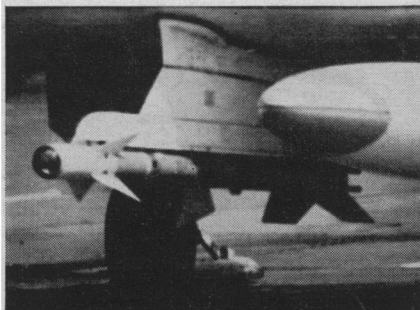
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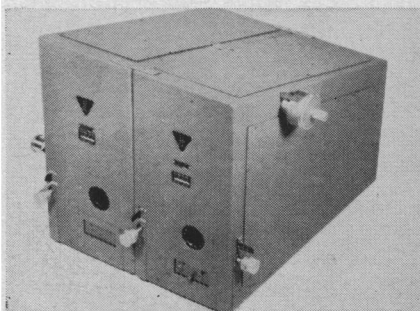
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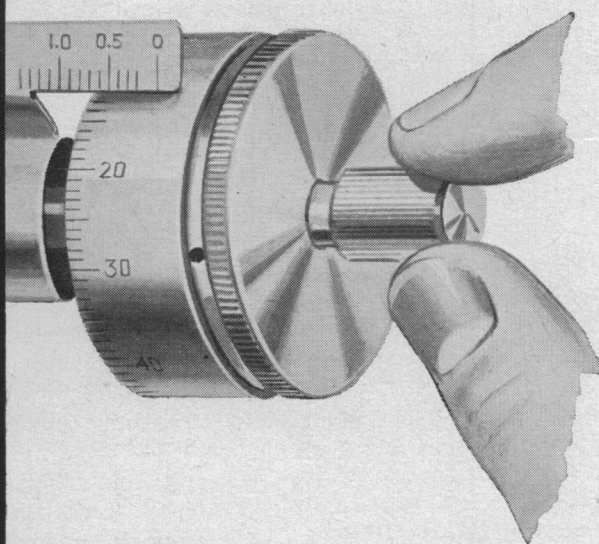


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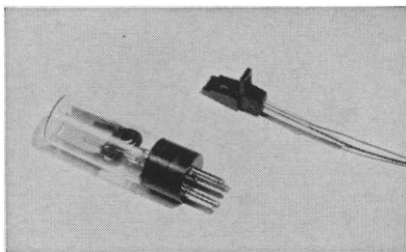
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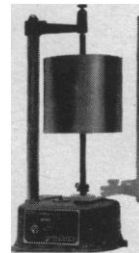


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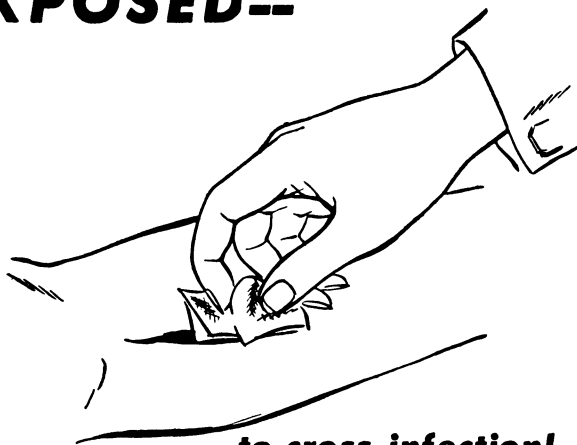


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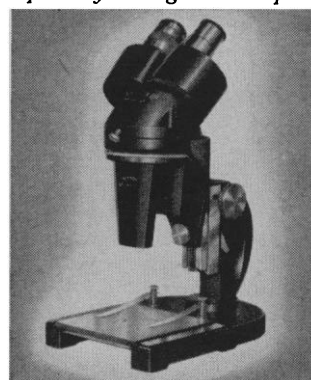
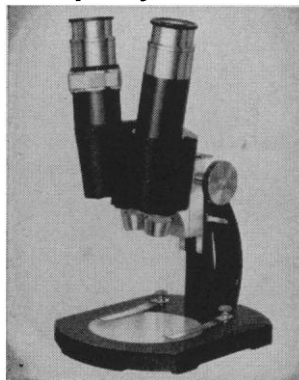
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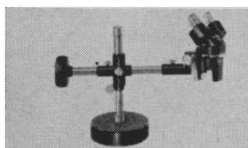
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5-7. Instrument Soc. of America (Natl. Chemical and Petroleum Symp.), Rochester, N.Y. (H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

5-7. Naval Structural Mechanics, 2nd symp., Providence, R.I. (E. H. Lee, Brown Univ., Providence.)

5-14. American Chemical Soc., natl., Cleveland, Ohio. (A. T. Winstead, ACS, 1155 16 St., NW, Washington 6.)

6. The Allergic Child, symp., New Haven, Conn. (V. L. Szanton, Hospital of St. Raphael, New Haven 11.)

6-8. Biochemistry and Pharmacology of Compounds Derived from Marine Organisms, symp., New York, N.Y. (R. F. Nigrelli, Dept. of Marine Biochemistry and Ecology, New York Aquarium, Seaside Park, Eighth St. and Surf Ave., Brooklyn 24, N.Y.)

6-8. Hyper-Environments—Space Frontier (Inst. of Environmental Scientists), Los Angeles, Calif. (M. S. Christensen, IES, 6251 Marita St., Long Beach 15, Calif.)

6-8. Radiofrequency Spectroscopy Group, Nottingham, England. (J. E. Ingram, RSG, c/o Dept. of Electronics, Telecommunications and Radio Engineering, Univ. of Southampton, England.)

6-8. Structural Design of Space Vehicles, conf., Santa Barbara, Calif. (A. F. Denham, 925 Book Bldg., Detroit 26, Mich.)

6-9. Mineral Processing, intern. cong., London, England. (B. W. Kerrigan, Institution of Mining and Metallurgy, 44 Portland Pl., London, W.1, England.)

7-8. Cathode Protection, European symp., Frankfurt am Main, Germany. (Secrétariat du Symposium, Deutsche Gesellschaft für Metallkunde, Alteburgerstrasse 402, Köln-Marienburg, Germany.)

7-8. Municipal and Industrial Waste, 9th southern conf., Raleigh, N.C. (C. Smallwood, Jr., North Carolina State College, Extension Div., Box 5125, Raleigh.)

7-9. American Assoc. of Railway Surgeons, Chicago, Ill. (C. C. Guy, 5800 Stony Island Ave., Chicago 37.)

7-9. Association of Surgeons of Great Britain and Ireland, Birmingham, England. (F. A. R. Stammers, 47 Lincoln's Inn Fields, London, W.C.2, England.)

7-9. Optical Soc. of America, Washington, D.C. (K. S. Gibson, OSA, Natl. Bureau of Standards, Washington 25.)

8-9. American Assoc. of University Professors, Detroit, Mich. (P. R. David, Univ. of Oklahoma, Norman.)

8-9. New Mexico Acad. of Science, Socorro. (K. G. Melgaard, P.O. Box 546, University Park, N.M.)

8-9. Southern Soc. for Philosophy and Psychology, Biloxi, Miss. (E. Henderson, Florida State Univ. Tallahassee.)

8-11. American Dermatological Assoc., Boca Raton, Fla. (W. M. Sams, 308 Ingraham Bldg., Miami 32, Fla.)

9-10. Histochemical Soc., 11th annual, New York, N.Y. (H. W. Deane, Albert Einstein College of Medicine, Bronx 61, N.Y.)

10-11. American Soc. for Artificial Internal Organs, Chicago, Ill. (C. K. Kirby, ASFAIO, 3400 Spruce St., Philadelphia 4, Pa.)

11-13. American College of Surgeons, Minneapolis, Minn. (H. P. Saunders, 40 E. Erie St., Chicago 11, Ill.)

11-13. Electrical Engineering in Space Technology, 1st conf. (AIEE), Dallas, Tex. (B. J. Wilson, Naval Research Laboratory, Washington, D.C.)

11-13. Forest Tree Growth, intern. conf., Tucson, Ariz. (Forest Tree Growth Conf., Laboratory of Tree-Ring Research, Univ. of Arizona, Tucson.)

11-14. American College Personnel Assoc., Philadelphia, Pa. (M. D. Hardee, Florida State Univ., Tallahassee.)

11-14. American Meteorological Soc., 8th weather radar conf., San Francisco, Calif. (H. G. Houghton, AMS, Dept. of Meteorology, Massachusetts Inst. of Technology, Cambridge 39.)

11-15. American Assoc. of Immunologists, Chicago, Ill. (C. Howe, Columbia Univ., College of Physicians and Surgeons, New York 22.)

11-15. American Inst. of Nutrition, Chicago, Ill. (G. M. Briggs, Div. of General Medical Sciences, National Institutes of Health, Bethesda, Md.)

11-15. American Physiological Soc., Chicago, Ill. (R. G. Daggs, 9650 Wisconsin Ave., NW, Washington 14.)

11-15. American Soc. for Experimental Pathology, Chicago, Ill. (F. J. A. McManus, Univ. of Alabama Medical Center, Birmingham.)

11-15. American Soc. for Pharmacology and Experimental Therapeutics, Chicago, Ill. (K. H. Beyer, Merck, Sharp & Dohme Research Laboratories, West Point, Pa.)

11-15. Federation of American Soc. for Experimental Biology, Chicago, Ill. (M. O. Lee, 9650 Wisconsin Ave., NW, Washington 14.)

11-16. American Assoc. of Anatomists, New York, N.Y. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia 4.)

11-16. American Soc. of Biological Chemists, Chicago, Ill. (F. W. Putnam, Dept. of Biochemistry, Univ. of Florida, Gainesville.)

11-16. Anatomical Congress, 7th intern., New York, N.Y. (D. W. Fawcett, Dept. of Anatomy, Harvard Medical School, Boston 15, Mass.)

11-16. Congress of Anatomy, 7th intern., New York, N.Y. (J. C. Hinsey, New York Hospital, Cornell Medical Center, 525 East 68 Street, New York 21, N.Y.)

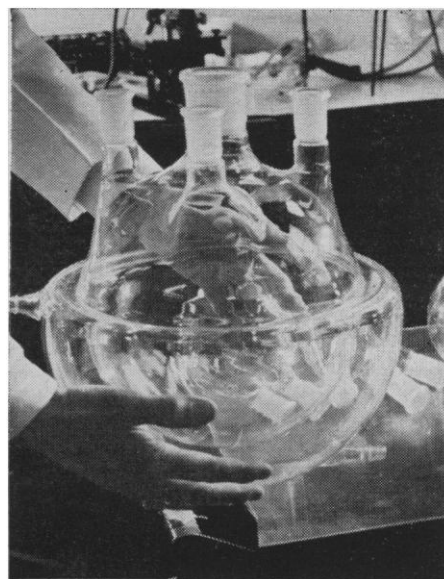
12-13. Microbial Genetics, symp., London, England. (B. W. Lacey, Soc. for General Microbiology, Dept. of Bacteriology, Westminster Medical School, London, S.W.1.)

13-15. American Public Health Assoc. (Southern Branch), Memphis, Tenn. (L. M. Groves, Shelby County Health Dept., Memphis.)

15-16. Eastern Psychological Assoc., New York, N.Y. (C. H. Rush, Standard Oil Co. (N.J.), Rockefeller Plaza, New York, N.Y.)

16. Pennsylvania Acad. of Science, Williamsport. (K. B. Hoover, Messiah College, Grantham, Pa.)

18-19. Radioactivity in Man, Measurements and Effects of Internal Gamma Ray Emitting Radiosotopes, AAAS symp., Nashville, Tenn. (G. R. Meneely, School



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