animals is repeatedly advanced, despite observations which argue against this possibility (*4–6*). The vitamin A content of the diet was not determined in these studies, however, and further convincing proof was not available. The present paper furnishes these data and, with measurements of food intake, body weight, and liver vitamin A, substantiates the belief that the amount of diet consumed has no effect on the body stores of the vitamin in the castrated mice studied.

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Manuscript received June 23, 1952.

Comments and Communications

Uncommitted Researchers

In re Benson's letter (Science, **116**, 233 [1952]): Most men who go in for science teaching and/or research have had their education given to them and have taken to science for their own diversion. The true scientist is only concerned with following his vocation to the best of his ability within the limits of his capacities. He is not properly concerned with hours of work, wages, fame, or fortune. For him an adequate salary is one that provides decent living without frills or furbelows. No true scientist wants more, for possessions distract him from doing his beloved work. He is content with an Austin instead of a Packard; with a table model TV set instead of a console; with factory- rather than tailor-made suits; with dollar rather than hand-painted neckties, etc., etc. To boil it down, he is primarily interested in what he can do for science, not in what science can do for him. The breed, unfortunately, is dying out.

Frederick J. Hammett
Provincetown, Massachusetts

Pollen Counts and the Hay Fever Problem

The transport of particulate matter by the atmosphere and, in particular, the dispersion of such matter through large volumes of air are—and have been—subjects of extended research. Much of the study to date has been devoted to problems attending the disposal of waste gases and vapors from industrial smokestacks, where there is essentially a point source of continuous emission of smoke and where the rate of emission is independent of atmospheric conditions. Such a situation has been analyzed by Sutton (*1*) for very small particles, 1 μ or less in diameter. The theory is far from complete, however, as evidenced by the recent efforts of Hewson *et al.* (*2*) to introduce a new approach to the subject.

In respect to airborne pollens, the problem of atmospheric transport and dispersion is still further complicated by the following considerations: (1) The emission of the pollen grains into the atmosphere depends directly on a complex of atmospheric conditions, including (*a*) low-level turbulence and gustiness to shake the pollen grains loose and to transport them upward into the air stream; (*b*) temperature and humidity suitable for ripening and drying the pollen grains. (2) The sources of pollen grains are spread more or less randomly over the landscape. (3) The pollen grains are in the 15–20 μ diameter range of sizes, the dispersion of which has been very little studied.

This means that there is at present no theory applicable directly to the problem of transport of hay fever pollens. It is possible, however, to speculate on the nature of the processes whereby pollens become airborne, and on the results of research on the dispersion of smaller particles. By this means one may crudely visualize the pollen distribution process.

To a sufficient approximation, the terminal velocity of fall of a ragweed pollen grain is about 2 ft/min with respect to its air environment. If one assumes that a strong gust strikes the natural pollen source and lifts the pollen grains to some height, h, above the ground, the distance to which the pollen grains will be carried may be estimated by the use of reasonable assumptions about the average vertical air speed along the path. This fails to give information as to the dispersion, or lateral spread, of the cloud of pollen grains initially involved. As emphasized by Cramer (*2*), this spread is related to accelerations of the air stream which, in turn, produce accelerations of the particles forming the cloud and cause them to separate in some kind of stepwise process.

Although Sutton's theory gives an approximate solution for the dispersion of suspended particles of the order of 1 μ or less in diameter, it is clear that the larger the particle considered, the slower will be the rate of dispersion and the more rapid will be the rate of sedimentation. Since rate of dispersion is a function of acceleration, it will bear some proportionality to force/mass, where mass is proportional to D^3 and force is proportional to D^2. Thus rate of dispersion is related inversely to D, the diameter of the pollen grains.

Standard methods of measuring the "pollen count" are universally based on the assumption that the pollen grains are dispersed uniformly through vast volumes of air. This is the only assumption on which one can base the premise that the pollen counts taken at U. S. Weather Bureau city offices are meaningful to the residents of cities. It is, however, absolutely impossible to attain a state of uniform dispersion of particles the size of pollen grains in any appreciable volume of open air. Concentrations at any specified point depend primarily on the distance up-wind to the nearest pollen source and on the wind speed. Because of the slow rate of dispersion, the random nature of the location of sources, and the random occurrence of upward gusts, the pollen count may change quite drastically from one point to another only a short distance away and from one moment to another at a given point. It is undoubtedly this anisotropy that renders "official pollen counts" clinically useless, although this does not necessarily mean that pollen counts are useless. Counts made at any point in conjunction with pertinent meterological observations (i.e., wind speed and direction) would give useful information on the relations of pollen counts to the weather. It is even conceivable that particularly offensive local pollen sources could be located and eradicated by this method. In any case, the hay fever patient, whose allergy is reasonably specific, will derive greater benefits from the correlation of personal weather observations and symptoms, or pollen counts, for by this means he will be forewarned of unfavorable or favorable conditions to come.

Instead of reporting of "pollen counts," local weather bureau and news dispensers would be more helpful if they would forecast wind speeds and directions, and the general expected state of air pollution (*stability*, in meteorological parlance). These are elements of the weather and, contrary to an apparent popular impression, they are fully as important as the temperature and humidity in a given locality.

NELSON DINGLE

Department of Physics and Astronomy
The Ohio State University

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Book Reviews

Introduction to Geophysical Prospecting. Milton B. Dobrin. New York–London: McGraw-Hill, 1952. 435 pp. $7.00.

The author has produced a much-needed textbook, intermediate in character between the exhaustive treatises by C. A. Heiland and J. J. Jakosky, and the more popular treatment by Eve and Keyes. The treatment is similar to L. L. Nettleton's in *Geophysical Prospecting for Oil,* but is more exhaustive and, furthermore, attempts to include a coverage of geophysics in mining exploration. Because of the author's association with a petroleum company, it is to be expected that the treatment of oil geophysics will be more accurate and more thorough than that of mining geophysics. By far the larger part of the book is devoted to the geophysical techniques that have contributed so greatly to the development of the oil industry—108 pages being devoted to seismic technique, 89 pages to gravitational techniques, and 73 pages to magnetic prospecting, whereas electrical methods (exclusive of well-logging) are covered in 28 pages, and radioactive methods in 19 pages. The remaining 100-odd pages are devoted to the integration of geophysical methods, well-logging methods, radio position locations, and current research in geophysical exploration. The allocation of space reflects the current relative importance and extent of application of geophysical methods in the oil industry in contrast with the mining industry.

The treatment of the various subjects is mathematical in approach, but does not require knowledge of mathematics beyond trigonometry. It is not an elementary text suitable to a survey course for geologists or engineers, but it should be valuable as an introductory text for those who expect to be, or to work closely with, geophysicists. Each branch of geophysics is dealt with systematically, and the fundamentals of that geophysical science to which each exploration technique is related is considered. Thus, the subject of gravitational prospecting is related to the broader field of the earth's gravitational force; magnetic prospecting is set against the background of the earth's magnetic field; and earthquakes and the information they yield about the internal constitution of the earth form the background for the discussion of reflection and refraction prospecting. Considerable attention is devoted to the instruments used in the various methods, the treatment of the data obtained, and the interpretation of the results.

The few paragraphs devoted to the history of geophysical prospecting give the erroneous impression that the electrical and magnetic techniques are recent developments. No acknowledgment appears of the early work of Robert Fox, of Cornwall, in 1830, and of Carl Barus in Nevada in 1880, on the spontaneous polarization or self-potential method, nor of the fact that Robert Fox was the first to suggest that resistivity measurements of the earth could yield geological