

longed TSH stimulation. The fact that the mouse thyroid tissues were continued for a longer period in a continuous state of stimulation than were those of the rat may be one explanation for the successful development of thyroid tumors in mice transplantable to normal animals. Wollman, Morris, and Green (7), in preliminary studies of the functional activity of 4 tumor sublines, found that 4 transplantable tumors showed a wide variation in ability to concentrate inorganic iodide or to convert it into thyroxine. These studies are suggestive of the potential value of experimental thyroid tumors as an aid to a better understanding of thyroid physiology and cancer. The pe-

culiarities of several sublines of thyroid implants and autonomous tumors in relation to their functional, histological, and cytological characteristics will be reported in detail elsewhere.

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Comments and Communications

Radioactivity of the Hot Springs of Tiberias¹

SEVERAL experiments that have been carried out in the past (M. Buchmann, *J. Palestine Med. Assoc.*, **25**, [8], 4 [1943]) appeared to indicate that the thermal springs located at Tiberias, Israel, are radioactive. In view of the fact that remarkable curative properties have been ascribed to these springs since antiquity, a new investigation, using the improved techniques that have become available during the past decade, has been initiated.

The springs issue at a temperature of 63° C. Their chief constituents, by weight, are the dissolved chlorides of sodium, calcium, and magnesium. Kodak N.T.A. plates with an emulsion thickness of 25 μ have been exposed by immersion in samples of water from the springs, in samples that were evaporated down to various increased concentrations, and in solutions of salts crystallized from the springs. Exposures were also effected by several other methods, including suspension of plates above the springs and evaporating samples on the surface of the plates. The age of samples varied from a few hours to several years.

Some of the exposures resulted in the appearance of peculiar structures. The dimensions and number per unit area of the phenomena were such that they could reasonably be attributed to α -radiation, but their spurious nature became evident upon close examination. Consequently, in the case of the relatively few exposures in which these pseudo tracks and stars appeared, they were excluded from the α -count.

Counts of α -tracks and stars failed to indicate any consistent activity above background. Control was maintained by addition of minute amounts of very weak standard solutions of radium barium bromide to samples and noting the increased α -counts. These control experiments indicate that samples emitting α -radiation energetic enough to produce discernible

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tracks—i.e., $E > 1.7$ mev, and of an activity exceeding 10^{-13} curies/cm³—would have yielded statistically significant net counts. β -radiation, as well as short half-life, or very low-energy α -activity would have escaped detection in these experiments.

Further research, making use of several types of counters, is being carried out in an effort to check on these possibilities, as well as to revise the present upper limit to the α -activity.

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Climate and Culture—New Evidence

IN 1932 (1) I suggested that the remarkable flowering of the mound-building cultures in the upper Mississippi and Ohio drainage had been coincident with a prolonged warm-dry phase of climate to which the name xerothermic has been applied. This period had been marked by a shift of continental vegetation, including grasslands, toward the Northeast. Such a movement was deduced by Gleason (2) on the basis of plant distribution, and later amply confirmed by pollen analysis of fresh-water sediments.

I also suggested that the replacement of the mound cultures by less advanced forest cultures was related to the subsequent cooling and increase of humidity. These conditions favored the return of forests.

Since 1948, with the active encouragement of Mexican colleagues and financial assistance from the Geological Society of America and the Wenner-Gren Foundation (Viking Fund), I have had an opportunity to study pollen sequences in relation to archaeology within the Mexico City Basin. This study has established the fact that the transition Late Archaic-Teotihuacan I took place during a prolonged dry period whose position in the sequence corresponds to our xerothermic.

The recent carbon 14 dating by Arnold and Libby (3) assigns this transition and the Hopewell mound

culture to about the same period—ca. 400–500 B.C.—and the Adena mound material to a date—ca. A.D. 800—not far from the end of Teotihuacan as usually accepted. Thus the Hopewell-Adena span appears to correspond roughly to the Teotihuacan period in Mexico—an interval during the early part of which the basin floor below Teotihuacan seems not to have been the scene of much cultural activity.

It is true that some Archaic mound material (antler and shell) from Kentucky has been assigned an antiquity of the order of 3000 B.C. This naturally raises the question of its relation, ethnic and cultural, to the much later Hopewell. On internal evidence the Mexican affinity of the latter seems strong. Was this affinity an effect of mass migration, or of a more subtle influence?

At any rate, it is now clear that the great flowering of the Ohio Mound cultures took place during the xerothermic, when dry climate, minimum lake levels, and suspended activity characterized the inner Basin of Mexico City.

This situation offers a remarkable parallel to the intrusion of cereal culture in Scandinavia during the warm dry sub-boreal (4). So far as I can tell, the latter corresponds in position to our xerothermic, but how closely it corresponds chronologically can only be determined by further research.

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Illiteracy Triumphant

CHESTER LONGWELL certainly deserves hearty congratulations for his letter, "The 1950 Silly Season," published in the April 13 issue of *SCIENCE*. Many readers must have been as delighted as I was with his pungent remarks about the *Saturday Evening Post's* inspired editorial in defense of Galileo, Velikovsky, and *Worlds in Collision*.

Now for the next important point—where do we go from here? A good chuckle and a well-directed barb may be enough for Dr. Longwell, but not for me. The editorial was silly. As a work of scientific research, *Worlds in Collision* ranks with Grimm's fairy tales and the *Rubaiyat*. The increasing popularity of pseudo science is a matter for the deepest concern.

These truths are self-evident in the columns of *SCIENCE*. But isn't the problem important enough for more than a few semiprivate communications among friends, or an occasional biting book review? Has the shift of publishers from Macmillan to Doubleday (which has no soft underbelly in the form of a textbook department) improved the situation in any fundamental sense? Can scientists do more than they have done, and take positive steps through their professional societies?

The above questions are only partly rhetorical. I feel that something more ought to be done; perhaps others will not consider it worth the trouble. But I am reminded of the biologists and physicians who are taking aggressive action against the antivivisectionists. Also, the American Psychological Association has spoken out mildly against dianetics and "engrams."

Why haven't the astronomers, linguists, geologists, or anthropologists—speaking through their societies—come out with their feeling about *Worlds in Collision*? Or should that be the function of the AAAS? If not, is there an organization that represents the body of American science in such matters?

The pseudo-science enthusiasts have excellent public relations. Science has no public relations to counteract them. We are justly proud of the fact that the standards of popular science reporting as represented in the National Association of Science Writers are as high as any in the world. But it seems to me that scientists and their official representatives must take the initiative in combating pseudo science—and, on the positive side, presenting science and the scientific method in the best possible light.

This would not be an easy task, even if we were not on the verge of a dangerous reaction against research and rational thinking of all kinds. The difference between Galileo and Velikovsky hardly needs arguing here. But it may be helpful to shift our perspective for a moment. An American who has not been trained in science may sincerely feel that Galileo and Velikovsky are both martyrs of "authoritarian" tendencies. Imagine that we have to show him the error of his ways—and, sooner or later, we may have to do just that. What shall we tell him, and how shall we put it? We must be as articulate and brief as that *Saturday Evening Post* editorial which, for all its silliness, was clearly written in straightforward language.

Science has a message beyond the results it has achieved in medicine and technology. It has not yet succeeded in communicating this message to the American public, and, until it does, pseudo science will continue to find a wide audience. Perhaps some publishers, authors, and scientifically illiterate critics deserve the lion's share of the blame. But scientific societies deserve a brickbat or two. They know the facts—and have maintained a dignified silence.

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(Editorial Note: *The editors disclaim any dignity in the silence maintained in SCIENCE until Chester R. Longwell's comment was published. They have been only too mindful of the box-office successes and best-seller records of plays and books that have been literary and financial failures until some society, watchful of public morals, gave them the boost that paid off. There is, however, cause for alarm that there are publishers and editors so scientifically illiterate as to appear unable to differentiate between fact and fiction—authentic science and hoax.*)