The U. S. Civil Service Commission has announced an examination for filling Geologist positions at salaries ranging from $4,149 to $7,102 a year. Vacancies are located in Washington, D. C., and vicinity in various Federal agencies, and throughout the United States in the Departments of Agriculture and Interior. Competitors for these positions will not be required to take a written test. To qualify, they must have completed either a four-year college course leading to a Bachelor's degree in geology, or a time-equivalent combination of study in geology and technical experience. In addition, they must have had professional experience in geology. Graduate study may be substituted for a part of the required experience.

Further information and application forms may be obtained at most post offices, from Civil Service regional offices, and from the U. S. Civil Service Commission, Washington 25, D. C. Applications will be accepted in the Commission's Washington Office until further notice, but persons interested in being considered for positions which will be filled immediately should apply by August 15, 1947.

Make Plans for—

American Mathematical Society, First Annual Symposium in Applied Mathematics, August 2–4, Brown University, Providence, Rhode Island.

American Veterinary Medical Association, August 18–21, Cincinnati, Ohio.

New England Association of Chemistry Teachers, 9th Summer Conference, August 18–23, Wellesley College, Wellesley, Massachusetts.

American Pharmaceutical Association, August 24, Milwaukee, Wisconsin.

American Society of Mammalogists, August 24–27, Higgins Lake, Michigan.

Americal Institute of Electrical Engineers, Pacific General Meeting, August 26–29, San Diego, California.

American Association for the Advancement of Science, 114th Meeting, December 26–31, Chicago, Illinois.

COMMENTS
by Readers

So much valuable material is included in Robert M. Salter's paper on "World Soil and Fertilizer Resources" (*Science*, May 23, p 533) that criticism would seem carping were it not that the treatment of the problem is dangerously misleading. It manages to pile up on both the Scylla and Charybdis what the general semanticists call elementalism and identification (Alfred Korzybski. *Science and sanity*, 1933).

It is elementalistic in its isolated discussion of soils, and of fertilizers, which are without meaning, in the world food complex, except as components of the total environment. It overlooks our profound scientific ignorance of how to cope with tropical environments, where only an insignificant amount of research has been carried on. It disregards the illiteracy rate (often 100 per cent) of tropical peoples—and what might be called the ecological illiteracy everywhere of leaders, including legalistic- and "economy"-minded legislative bodies. It begs the question of whether terror-ridden bureaucracies will be able to cope with wind erosion on the chernozem soils of Central Asia. It ignores the instability and corruption of many governments, which seem to exist primarily to line their own pockets.

What of disturbed hydrologic regimes, with their sequelae of floods, drought, falling water-tables, erosion, that have effectively removed from potential circulation millions of acres in Asia, Africa, and South America? What of the burning, overgrazing, overcropping, and deforestation that have made Africa moribund (Jean Paul Harroy. *Afrique, terre qui meurt.* Brussels: Marcel Hayez, 1944)? What of the folkways of Asiatic and African primitives and American pressure groups that measure their wealth in destructive numbers of cattle rather than long-time yields? What of the plague of shifting agriculture that, under increased population pressures, every year sends more millions of tons of soil down the world's rivers, especially those of the tropics? What of the need to resettle hundreds of millions of people already on the land, to give them a decent living standard, and halt erosion? Of what use are millions of tons of fertilizer to India, where 60 per cent of the population has an *annual* per-capita income of $9.30 (S. Chandrasekhar. *India's population*, 1946)? How available are the soils of the tropics, when those who work them face almost certain early death from malaria, dysentery, schistosomiasis, sleeping sickness, and a number of other ills, the control of which is inordinately expensive? What of land tenure systems, tenantry, the colonial and American industrial attitude toward the land, which operates in terms of *this year's* profits? All these factors, it should be borne in mind, are interrelated in a dynamic complex in which it is rare that one does not have an influence on all, or most of, the others.

The paper further suffers from identification of U. S. conditions with those of the rest of the world—it has been done in Iowa; therefore, it can be done in Albania. I have never been in Albania, but I have traveled in many other countries; most of them are decades, perhaps centuries, behind the United States in land-use techniques. Not, of course, that we are sitting pretty. We are still losing the battle of soil conservation. We continue to go into the red, from the forest point of view. It is touch and-go whether our western ranges can be saved from the sheep and cattle men. Many of our rivers have been turned into open sewers. Even so, there are few countries outside western Europe that are not far worse off than we.

Meanwhile, the world population is daily increasing at the rate of 50,000 empty stomachs. According to our notions, they should be filled three times a day. It is pleasant to think of 1,300,000,000 available acres and x million tons of fertilizer with which to do it. Unfortunately, for practical purposes, these are as unavailable to hundreds of millions of the earth's people as the gold at the end of the rainbow. And because of man's

unintelligent waste of the soil he is using, and his irresponsible breeding, the marginal lands remaining every year become more marginal.

The problem *can* be solved, but not by resting on a downy bed of false optimism. (WILLIAM VOGT, *2101 New Hampshire Avenue, N.W., Washington, D. C.*)

I agree entirely with Dr. Yerkes (*Science*, May 2, p. 461) in his defense of the scientific status of psychology and the social studies and in his statement that "the scientific method can be applied to all natural *phenomena*" (italics mine); but I think his attack on the *Endeavour* article, as quoted, somewhat confuses the issue. That science can, with sufficient knowledge of the data, predict "whether a picture will have an aesthetic appeal" as a matter of psychological fact to this or that type of observer I do not doubt for a moment; but as to whether the picture *ought* to call forth a favorable aesthetic response, whether it is *deserving* of such a response, science can say nothing; and I think this is really what the author of the *Endeavour* article is chiefly concerned in conveying to his readers. Science is limited to a consideration of what phenomena *are*, but, regarding what *ought* to be, it can say nothing. In other words, all phenomena have a nonphenomenal aspect which scientific method cannot touch, and the values of goodness and beauty to which the author of the article under consideration refers belong to this extrascientific realm. (JARED S. MOORE, *Western Reserve University, Cleveland, Ohio.*)

Alfred E. Emerson has recently pointed out (*Sci. Mon.*, 1947, 64, 343) that human society is largely governed, not by physiological processes (such as are the inherited determinants of activity in a termite society), but by a symbolism that has to be learned. Mathematics, which Bridgman has said is a human invention, is the most significant element in this learning. It can be said to have created science and its results in the industrial revolution that has pyramided the human population of the earth. (See Karl Sax. *Sci. Mon.*, 1944, 58, 66-71.)

Modern society is therefore mathematically conditioned from top to bottom. Nothing that is not mechanical, *i.e.* nothing that does not conform to Lord Kelvin's definition of science as a knowledge arising from being able to "measure what you are speaking about and express it in numbers," can have any bearing on solving social problems. In none of its forms is life mechanistic. But human society, because it is *not* a "living structure," is mechanistic in the character of what Yerkes (*Science*, May 2, p. 462) notes as "this vast array of recent discovery and of technical applications in various branches of human engineering."

Our social problems are therefore coldly intellectual in the detached manner of science. They belong, I suspect, to the cerebrospinal system which is the directive, not the impulsive, autonomic system, with hormones conditioning its reactions. They deal with, but are not themselves, natural phenomena. They are ethical in character, *i.e.* they concern right and wrong as affected by truth and falsehood in what Northrop (*The meeting of East and West*. New York: Macmillan, 1946. P. 442 ff.) calls "epistemic correlations." They are problems, not in observing behavior as if it were conditioned by inherited "ecto-hormones" (Emerson), but in conditioning behavior by institutions which are the locus of the "free will" thus taken over from the individual as he is constrained, by their logic or illogic, into rational or irrational behavior. It is thus not true that (Emerson, *op. cit.*, p. 344) "the problems of human society are much closer to those being solved by the biologists than they are to those of astronomy or nuclear physics."

Whatever psychology may have accomplished or failed to accomplish is irrelevant socially if it is dealing with natural phenomena under hereditary stimuli. Therefore, a "lack of faith in the applicability of scientific procedures to psychological and social phenomena" is warranted (*contra* Yerkes, *op. cit.*, p. 462), because social phenomena are not natural, *i.e.* they are not psychological, but are intellectual. And intellectual controls are not real, natural phenomena but are ideal, purposive inventions, with social objectives, which may or may not be rational, *i.e.* suited to their purpose.

Any organism can make a bad, even a fatal, choice. But when "all we like sheep have gone astray," we have done it by *thinking* blindly *before* acting blindly, in concert. So, human cooperation is not necessarily beneficent, as is implied by current diplomatic palaver. An irrationally conditioned society cannot promote beneficent cooperation merely because its individuals or leaders wish to do so. Their logical, not their psychological, directives determine the nature of events; and the events do not contain their own causation as in natural phenomena. If they did, prayerful thinking would be quite in order and would be correctly fatalistic.

The historical materialism that is shaping the *irrationale* of the current institutional developments of "socialism" is irrational in its interpretations because it believes, as does Dr. Yerkes (*op. cit.*, p. 461) that "the scientific method can be applied to all natural phenomena" and that social phenomena are natural in their sequences. That this is not true is the central theme presented by Northrop (*op. cit.*, p. 255 ff.) in protesting against the culturalistic fallacy of trying to derive a normative theory from the factual theory of social "science."

Thus, the "hosts of us who are now classified as scientists" may well be "self-deceived workers who, unlike our physical science colleagues, are denied access to the truth concerning the natural phenomena which particularly interest us" (Yerkes, *op. cit.*, p. 462)—because they simply are not natural phenomena! The social psychologist, arbitrarily placing all events in the natural field, destroys the realistic epistemological dualism in philosophy upon which an effectively integrated science depends.

"Culturology" (see L. White. *J. Wash. Acad. Sci.*, 1947, 37, 181-210) may well serve as an escape from the egocentric predicament of the personal, psychological approach to social problems; but it seems certain that its rationale can only be, not that of a new empiricism, but simply the timeless metaphysical disciplines of philosophy and logic. We shall come to see mathematics as a cultural artifact or "human invention." As such, it represents a social device for choosing, not ends, but means; nor is it an "illusion of omnipotence" to recognize it as the ultimate in social recourses. Its logic is, indeed, compelling; but who would say that the laws of reason are as unbreakable in human society as are the laws of motion in the "infinite meadows of heaven"? Truth is not a robot! (ALDEN A. A. POTTER, *R.F.D. 3, Bethesda, Maryland.*)