Letters

Scientists Need a Group Opinion

I was pleased by Fletcher Watson's sympathetic and generally favorable review of my book *Science and Education at the Crossroads* [*Science* **129**, 459 (1959)]. One comment of his merits a response. He said that my suggestions "would require marked changes in public opinion; how these could be obtained still eludes many already immersed in the problems."

Watson's statement does not make clear which "public('s) opinion" he refers to. My book was written to help scientists formulate their own scientific (public or group) opinion (about professional policies—*not about scientific matters*) by doing two things: (i) setting up some clear-cut debating topics about "housekeeping" philosophy which could focus discussion, and (ii) describing the "housekeeping" (administrative) machinery that scientists must create to enable them to continuously formulate their own group opinion about scientific and educational policies.

Until these steps are taken, science cannot hope to guide the general public's opinion. At present much of the science and education news the public receives from radio, television or in the press is, or seems to be, mutually contradictory. Information theorists would say that the noise/message ratio is high. Hence the general public gets very little guidance from science to assist it in formulating its opinion. A great deal of this confusion would be reduced if scientists were spending a little more of their time than at present working on their administrative or political "housekeeping" problems. The AAAS has taken some generally correct, but in my opinion still too small, steps toward reaching the goal that United States science needs to reach as rapidly as possible. It's later than we think.

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Loyalty Oath

I should like to commend the review in the 6 March issue of *Science* [**129**, 625 (1959)] of recent efforts to rescind the loyalty oath provision of the National Defense Education Act.

I noted with interest the remark that scientists and scientific societies had not yet taken a stand on this issue and that their silence had been attributed to timidity. For the record, I should like to report that at its last meeting in January the Council of the Federation of American Scientists recorded its opposition to this loyalty oath requirement and instructed the executive committee of the FAS to communicate these sentiments to the Congress. Letters supporting repeal of this requirement have been sent to the sponsors of several of the bills that have been introduced for this purpose. In these we have expressed our opposition to the extension of loyalty tests to persons other than those who have access to secret information or who hold positions in which they may by their decisions and actions affect directly and substantially the national security. We have also expressed our particular fear that the antisubversion affidavit requirement in the National Defense Education Act will tend to inhibit free inquiry, association, and exchange of ideas among students and faculty.

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What Is a Profession?

In his letter, Hanor A. Webb speaks of two young scientists with majors in chemistry and biology [*Science* **129** 746 (1959)]. He then says: "These young people are specialists but they are not professionals. Professions . . . require certification. . . ."

A profession is determined not by certification but by training, code of ethics, and viewpoint toward the field of the profession. Historically, there are three "learned professions"—medicine, theology and law. Theology is not certified.

Profession is defined in *Webster's New International Dictionary* as "The occupation, if not purely commercial, mechanical, agricultural, or the like, to which one devotes oneself; . . . as, the *profession* of arms, of teaching, of chemist." It is of note here that the profession is "of teaching," not "of education."

The sections of the AAAS are an excellent list of scientific professions: mathematics, physics, chemistry, astronomy, geology, geography, zoology, botany, anthropology, psychology, social sciences, engineering, medicine, agriculture, education. Only three of these require certification, namely, medicine, education and, in some states, engineering. But the certification did not make them professions.

No, a profession requires training, a minimum of not less than four years of college with major work in the field of the profession and minor work in related fields. In addition to the basic college work, experience working either in the profession or for an advanced degree, doing original work, is needed before a person becomes a true professional.

Next, a profession requires a code of ethics either stated or observed in the field. For one such code in the profes-

sion of chemistry (that of the American Institute of Chemists) reference can be made to *The Chemist* [**35**, No. 4, 125 (April 1958)].

And last, a professional person will have pride in his profession and its accomplishments and live by the code of ethics of his profession. A true professional would never attempt to step into such fields as Webb suggests for the chemist or biologist in his letter, certification or no. But if the professional has the ability to teach, he will and can do a better job teaching his field than can a person with one or (in some cases) no course in that subject. A prime requisite for teaching is a great deal more knowledge of the subject matter than will ever be needed for the class. The teaching profession needs more instruction in the subjects to be taught rather than in how to teach. Certification does not make one a professional; one's viewpoint and training do.

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Shutoff Pulse Illusion

The "shutoff pulse illusion" described by R. L. Ives in the 30 January issue of *Science* [**129**, 272 (1959)] is clearly the temporal analog of the well-known Mach spatial gradient ("Mach ring") effect [E. Mach, *Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl. Abt. IIa* **52**, 303 (1865)]. Ives has drawn two-dimensional spatial patterns to illustrate diagrammatically the time-intensity course of the pulsed signals he used.

The direct comparability of Ives' temporal gradients with Mach's spatial gradients is borne out by the fact that if one actually stimulates the eye with two-dimensional spatial patterns of precisely the forms diagrammed by Ives, one perceives spatial brightness variations of the same kind as the perceived temporal variations described by Ives as the "shutoff pulse illusion." Similar stimulus patterns of many degrees of complexity were, as a matter of fact, designed and used by Mach to establish the empirical relations between perceived brightness and the derivative functions of the spatial distributions of light intensity. The spatial distributions used by Mach in his experiments are illustrated in his article and are reproduced in some of his other papers [*Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl. Abt. IIa* **54**, 131 (1866); *Vierteljahr. Psych.* **2**, 38 (1868)]. In the same connection, it is also of interest to note that Ives' diagrammatic representation of his time stimuli and their associated perceptual effects are remarkably similar to Vivian O'Brien's analogous representations of spatial patterns that give rise to Mach rings. See Fig. 9 of O'Brien's paper on contour perception [*J. Opt. Soc. Am.* **48**, 112 (1958)].

Mach's analysis of perceptual effects of this type led to his brilliant deduction that the phenomena could be explained only by assuming mutual interactions among adjacent retinal positions —a concept which has in recent years received direct confirmation from electrophysiological studies of neural activity. See, for example, papers by Hartline [*Harvey Lectures* **37**, 39 (1941–42)] and Hartline, Wagner and Ratliff [*J. Gen. Physiol.* **39**, 651 (1956)]. These interaction effects actually serve to enhance brightness and color differences between adjacent stimuli, whether the proximity is spatial or temporal (as in Ives' example). Because of this differential enhancement these effects are basic to the fineness of visual discriminations, and hence, as Hering emphasized, are basic to veridical visual perception of both contours and temporal sequences in the everyday discriminations of boundary changes in the visual field.

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