Dept. of Physics, Univ. of Rochester, Rochester.)

18–23. New England Assoc. of Chemistry Teachers, 20th summer, Kingston, R.I. (J. A. Martus, College of the Holy Cross, Worcester 10, Mass.)

18–25. Religion in the Age of Science, 5th summer conf., Star Island, N.H. (Institute on Religion in an Age of Science, 280 Newton St., Brookline 46, Mass.)

20–23. Photofluorography, intern. cong., Stockholm, Sweden. (International Cong. of Photofluorography, P.O. Box 5097, Stockholm 5.)

20–27. Australian and New Zealand Assoc. for the Advancement of Science, 33rd cong., Adelaide, Australia. (J. R. A. McMillan, Science House, 157–161 Gloucester St., Sydney.)

20–27. Genetics, 10th intern. cong., Montreal, Canada. (J. W. Boyes, Dept. of Genetics, McGill Univ., Montreal.)

21–23. American Farm Economic Assoc., Winnipeg, Canada. (L. S. Hardin, Dept. of Agricultural Economics, Purdue Univ., Lafayette, Ind.)

21–23. Chemical Organization of Cells, Normal and Abnormal, Madison, Wis. (J. F. A. McManus, Dept. of Pathology, Univ. of Alabama Medical Center, Birmingham.)

(See issue of 20 June for comprehensive list)

Letters

Behavioral Science

Your editorial on the desirability of "team projects" to produce "a unified theory" in "behavioral science" [*Science* **127**, 933 (1958)] stimulates several comments. Agreement with your conclusion that there are better "ways to spend money in this science" does not prevent disagreement on the reasons leading to it—and other matters.

As the editorial states, studies of social and physical phenomena—by some method—are similar in age. However, the study of human behavior by the methods of science is a recent thing. This "newness" has at least two implications:

1) It is premature to assume that the various studies of man (biological, psychological, social, cultural, and so on) will ever produce a body of knowledge of a size and compactness comparable to that of modern physics. Perhaps they will develop several bodies of knowledge closely related and interpenetrating, as, for example, chemistry, physics, and astronomy. Perhaps psychology, sociology, and anthropology—properly delimited—will prove to be as disparate but complementary as, say, geology, climatology, and paleontology. Is it not too early to state that the sciences of man and other social organisms will, or will not, produce a unified theory?

2) What do these new sciences-in-becoming now have to contribute toward a unified theory? Only psychology, perhaps, is well started on the development of a theory—that is, a system of tested propositions. The others have some generalizations to offer which are well replicated but which, in the main, are disconnected. While an exaggeration, the *mot* of a former colleague comes to mind: "The calculus is not the only place where you can't integrate nothing!"

I conclude that (i) we students of human behavior have every right to work toward a unified theory, alone or in teams, and "perennially" if we choose; (ii) at the moment, the slow, painstaking formulation, testing, and retesting of theoretical propositions is a more profitable use of time and what little money we are allotted.

Must *Science* perpetuate a misnomer like "behavioral science," however popular and widespread its use has become? Why do not those who study the "behavior" of protons, molecules, cells, or even galaxies object to this "steal" as loudly and legitimately as students of social phenomena should object to the reservation of "natural science" for studies of physical phenomena? However, an appropriate name for this division of the scientific enterprise continues to elude us. The "social sciences," the "behavioral sciences," the "sciences of man," the

"sciences of human behavior"—all include too much or too little. Suggestions anyone?

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Fallout Near Nevada Test Site

Concerning "Strontium-90 in man" [*Science* **127**, 266 (1958)], I wish to point out the urgent need for public information on such radioactive fallout burdens being carried by populations in the vicinity of the Nevada test site. The problem of local fallout from atomic weapons tests seems to be a neglected subject, and obviously important data are not available to the interested citizen.

One cannot find or elicit more than a few items of indirect data on the strontium-90 content of human bone, soil, or food derived from the area in southern Utah most heavily contaminated with fallout from Nevada tests. This is an obvious area for intensive investigation, since it is known that some 10,000 persons in southern Utah have been subjected to fallout equalling a full-body gamma-ray dose in the range of 3 to 4 roentgens. This dose amounts to at least 30 times what most other persons in the United States have had to absorb, and indicates the possibility that there are unusually high strontium-90 burdens for that group.

Written requests for information on this subject were sent to the Utah State Department of Health, the Office of Test Information of the Nevada Test Organization, and the Atomic Energy Commission at the highest levels. The Atomic Energy Commission replied, "we have no samples of human bone from Utah," although Commissioner Libby has reported a few analyses of stillborns dated 1954 from central Utah. It was learned from C. L. Dunham, Division of Biology and Medicine, Atomic Energy Commission, that a dozen soil samples from southern Utah and Nevada were taken in the summer of 1957 and will be analyzed for strontium-90 in the near future. None of these agencies furnished the data needed to resolve the local strontium-90 question.

As a temporary substitute for actual data, I have attempted to estimate the strontium-90 fallout in southern Utah, using the known gamma field and the fission yield for strontium-90. Fractionation and weathering effects were ignored, but the method checked well against strontium-90 data for the Pacific islands. The details will be published in the 1957 *Proceedings of the Utah Academy of Sciences, Arts and Letters.* The result is that those areas which received 4 roentgens of gammas probably now have 245 ± 50 mc of strontium-90 per square mile of soil. I understand through Dunham that the Atomic Energy Commission has made a comparable calculation, based on somewhat more optimistic assumptions, leading to a prediction of unweathered strontium-90 fallout of 160 mc/mi^2.

In the region of concern, the people consume a relatively high proportion of home- or locally grown vegetables and milk products.

These figures mean that by 1970 several thousands of residents of southern Utah will probably carry a bone burden of strontium-90 in excess of 100 "sunshine units" as a result of Nevada tests to date. That conclusion is based on authoritative estimates of exchangeable calcium in the soil and on the method of calculating strontium-90 transmission along the ecological chain presented recently by J. D. Teresi and C. L. Newcombe [U.S. Naval Radiological Defense Laboratory, *Reviews and Lectures, No. 47* (9 Aug. 1957)].

One hundred "sunshine units" of strontium-90 represents a recognized level of alarm for adult populations and worse than that for children. Clearly, there is an urgent need for more information on fallout effects in southern Utah, and for changes in nuclear testing policy.

Recently the National Committee on Radiation Protection and Measurement lowered the maximum permissible radiation dose for workers in and around industrial nuclear operations and for other groups. The new maximum permissible radiation dose of 0.5 rem per body per year applicable to populations is less than one-seventh the dose rate (3.9 r/yr) which the Atomic Energy Commission has assured us is "safe" for areas adjacent to Nevada bomb tests. The term *safe* when applied to 3.9 roentgens, full body, is misleading at best and refers only to gamma effects, without considering the associated strontium-90 hazard.

It is not clear from official announcements whether the Atomic Energy Commission will adopt the new maximum permissible radiation dose for areas adjacent to bomb test sites, as it has for industrial operations, or whether the commission will continue to regard these as "controlled areas." Surely a double standard should not prevail unless the populations concerned are informed and are willing.

The new maximum permissible radiation dose, if applied uniformly, would at least keep future additions to the strontium-90 burdens in southern Utah and Nevada within more reasonable bounds. However, other measures must be sought for alleviating the harm that has probably already been done there, if the present estimates of the strontium-90 burdens are substantiated by actual analyses of human bone.

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