mann, École Polytechnique, Federale, Zurich, Switzerland.)

12–25. International Soc. of Soil Mechanics and Foundation Engineering, 4th Conf., London, England. (A. Banister, Institution of Civil Engineers, Great George St., London, S.W.1.)

18–21. American Astronomical Soc., Urbana, Ill. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

19–21. National Council of Teachers of Mathematics, Northfield, Minn. (M. H. Ahrendt, NCTM, 1201 16 St., NW, Washington 6.)

19–22. American Veterinary Medical Assoc., annual, Cleveland, Ohio. (J. G. Hardenbergh, AVMA, 600 S. Michigan Ave., Chicago 5, Ill.)

19–23. Clay Conf., 6th natl., Berkeley, Calif. (Dept. of Conferences and Special Activities, Univ. of California Extension, Berkeley 4.)

19–23. Clinical Chemistry, 2nd international European cong., Stockholm, Sweden. (K. Agner, Box 12024, Stockholm 12.)

19–24. Finite Groups, internatl. colloquium, Tübingen, Germany. (H. Wielandt, Faculty of Mathematics and Natural Science, Eberhard-Karls-Universität, Tübingen.)

(See issue of 17 May for comprehensive list)

LETTERS

The editors take no responsibility for the content of the letters published in this section. Anonymous letters will not be considered. Letters intended for publication should be typewritten double-spaced and submitted in duplicate. A letter writer should indicate clearly whether or not his letter is submitted for publication. For additional information, see Science **124**, *249 (1956) and* **125**, *16 (4 Jan. 1957).*

Literature, Science, Manpower Crisis

Unusual importance attaches to the article on "Literature, science, and the manpower crisis" by Joseph Gallant [*Science* **125**, 787 (26 Apr. 1957)]. If it could be read by all those who are engaged in building high school curriculums, by a large proportion of those who teach in upper primary and secondary schools, by those who write textbooks for these grades, by those who train teachers, and by key members of state and city boards of education, the shortage of scientists and technologists would surely soon be reduced; and, even more far-reaching and contrary to present reasonable expectation, a start might soon be made toward making basic scientific concepts acceptable in American culture. During the 50 years that I have been a reader of *Science* I have found neither in its pages nor elsewhere an equally cogent statement of the prime sources of present educational deficiency or failure in the sciences.

Two sentences will recall the core of the contribution: The problem centers in the high school. Involved there is practically the whole of the curriculum —not merely science and mathematics, but literature, history, and other of the humanities as well. Fortune has left it for a scholar in literature, and one actively teaching in a famous New York high school, to *document* satisfactorily the definite (and ultimately persuasive) prescientific bent of humanistic teaching in our high schools and, to point sharply to the resulting dichotomy in the basic thought and motivation of our people, involving an over-all denigration of the status and concepts of science. I quote: "But the humanities sweepingly ignore the role played by scientific insight and thinking in the ideology of our times and disdainfully march on their archaic way as though the atomic and electronic age had not arrived. . . . students must be attracted to the study of sciences, not *after* they are enrolled in the colleges, but *before*; not after they have elected physics and chemistry in the secondary schools, but before they do so. Moreover . . . they must be endowed with a perspective that will provide them with a profound and continuing motivation to apply themselves."

A clear, persuasive, and unhedged statement illuminating this much-

avoided center of our prime cultural problem has now appeared in *Science*. This statement supplies conclusive evidence that our "manpower crisis" is an inseparable part of the more inclusive cultural problem and, apart from the latter, will not be solved adequately by the various helpful measures already envisaged or employed. Presumably, the potential of this exceptional publication is convertible to the actual only through making the article available to many or all of the hundreds of thousands mentioned here. Even such wide distribution of a powerful challenge would doubtless early meet only partial success; but a worse outcome awaits a neglect of this supplement to current "manpower" efforts, and surely much fresh interest in the manpower problem should now favor some success to a definitely directed urge that scientific concepts become respectable in our secondary education. Thus we arrive at questions of practical action: Can *Science*, or can individual or collective scientists, devise or provide means to that end? Where republication? Costs of lists, and of mailing reprints? In the annals of research these items seem something less than gigantic or formidable, but perhaps they can and will block a promissing perceptible lift to both national safety and culture.

OSCAR RIDDLE

Plant City, Florida

Joseph Gallant's major thesis that all insights into the nature of the universe are the proper province of literature [*Science* **125**, 787 (1957)] appears well-taken. It is rather to support his contention than to cavil at it that one may question the correctness of his assertion that there are almost no contemporary instances of poetic integration of scientific concepts beyond the three cases he cites (Robinson Jeffers, Archibald MacLeish, and Mark Van Doren). Perhaps too much reliance was placed on the showing of exhaustive research in Helen Plotz' *Imagination's Other Place*, since from merely casual recollection it is possible to cite among the notable omissions from this anthology such names as those of Max Eastman, James Franklin Lewis, Alfred Noyes, Selden Rodman, A. M. Sullivan, and William Carlos Williams. Perhaps the list would grow more readily if the editorial board of *The Scientific Monthly* would reinstate F. L. Campbell's policy of publishing such work.

WILLIAM NEWBERRY

Olin Mathieson Chemical Corporation, New Haven, Connecticut

"I own the soft impeachment" of William Newberry's letter. If I have overlooked particular poems which utilize scientific concepts, it is because these poems are not among the best known works of the poets cited nor those that

are regarded by critics as representative of the poet's work—with the possible exception of the work of William Carlos Williams, for the omission of which there can be no excuse.

But this oversight on my part only highlights the more the fact that the scientific orientation of a poet's thoughts or emotions is the one aspect that literary discussion and criticism consistently neglect. This in turn emphasizes the urgency of focusing attention on the relationship of science to poetry and to literature in general.

On the curricular and pedagogic level the implication for me is that some agency should be set up to cull our imaginative literature, both prose and poetry, for revealing instances of the successful integration of scientific ideas and images with lyrical or imaginative expression and to bring these to the attention of teachers and students through recommended reading lists and anthologies. These will, in time, affect the standard syllabi and the standard literary anthologies. Such an agency would have to be charged with both research and public education.

On the creative and critical levels, new works incorporating the scientific outlook might be fostered by conferring the recognition and prestige of scientific bodies on them in some way, or by setting up an agency to do so, which might be a link between the humanities and science.

It might be well for scientific societies, the various manpower agencies, or associations of technologic firms to consider creating such an agency for its ultimate effect on our culture and our scientific manpower resources. What seems to be most needed is an instrument for closer liaison of the humanities and science, not only in organizational terms (between, say, scientific professional groups and literary and scholarly associations), but also in terms of research, intercommunication, and publicity.

JOSEPH GALLANT
Theodore Roosevelt High School, New York, N. Y.

Radiation and Health

I can only partially agree with the statements expressed in your editorial, "Radiation and health" [*Science* **125**, 719 (19 Apr. 1957)]. The information on the radiation genetics of our species is exceedingly meagre, and currently we are forced to extrapolate from data collected by radiation geneticists working on the mouse, fruitfly, and various plants and microorganisms. To collect data for our species, we shall have to gather every scrap of information that results from each sizable exposure of the human reproductive system to ionizing radiation. Presumably, such exposures can occur accidentally or from medical diagnostic and therapeutic procedures.

I will grant that a record of exposures may be of no value to the individual keeping it, since the decision to expose this individual to further x-rays is primarily governed by the need for medical diagnosis or therapy. This is not the point, however. The value of records of this kind is that as they accumulate and the pedigrees of exposed individuals become available, only then can the geneticist attempt, from an analysis of these data, to determine the exact magnitude of the radiation hazard to the human germ plasm.

When one is ignorant admit it, proceed cautiously, and attempt to remedy the situation. In genetics, as G. Mendel has observed, the only way to remedy ignorance is to engage in the bookkeeping necessary for the construction of pedigrees. The answer to the question "Would the considerable effort required to keep such records for a large part of the population be worth while?" is an unqualified *Yes.*

ROBERT C. KING
Department of Biological Sciences, Northwestern University, Evanston, Illinois