is clear that Soviet science, and biology in particular, was heavily damaged by Stalin's assault on genetics. I see no evidence, however, on the basis of the historical record up to this time, that science necessarily flourishes better under a democracy than under an authoritarian regime, provided the latter is reasonable enough to allow investigators to pursue their researches without interference, in the field of their interest. I doubt whether the imagination of Soviet physicists and chemists in attacking scientific problems today is significantly inhibited by the fact that the free play of thought and discussion in the domain of the social sciences is sharply restricted in Russia. The Russian biologists may suffer more than the physicists and chemists, since their field of research is closer to the social sciences, but here the wounds suffered by Soviet biology in the Lysenko controversy have probably been a more important factor.

The spirit of independent inquiry, which is essential for every scientist, sometimes spreads from the particular area of his research interests and becomes embodied in an independent and critical attitude toward the problems of the world in general. Hence, one may cherish the hope that totalitarian governments, which today are compelled to promote the development of science in order to maintain their position as world powers, will eventually become permeated by more liberal thinking on the part of their scientists, who may gradually come to assert their intellectual independence in wider spheres of thought and action. This, however, remains a hope, fostered by our own interests and predilections, not an established fact.

It has indeed been demonstrated in our time that the government of a democracy, such as that of the United States, can effectively foster the development of science on an unprecedented scale. In this sense experience has refuted the gloomy forebodings of Asa Gray, quoted in the first paragraph of this letter; but this is obviously no proof that a democratic society can promote the growth of science more effectively than any other.

The subject deserves more thought and research than has been given to it, and these brief remarks are offered largely in the hope that they may stimulate historians and social scientists to inquire more deeply into the relations between the growth of science and the form of government and society in which the scientists live.

JOHN T. EDSALL
Biological Laboratories,
Harvard University,
Cambridge, Massachusetts

Reference

1. A. H. Dupree, *Science in the Federal Government: A History of Policies and Activities to 1940* (Harvard Univ. Press, Cambridge, Mass., 1957), p. 156.

Proving Grounds in the Behavioral Sciences

Two sentences from a recent issue of *Science* [**135**, 503, 505 (1962)], one from the editorial "Prophecy fulfilled" and one from the article, "A scientific society—the beginnings," by Glenn Seaborg (neither sentence especially germane to the principal theme of either author), plus a sentence from the lead article of a later issue, "Strengthening the behavioral sciences" [**136**, 233 (1962)], places in juxtaposition factors which I believe underlie a major dislocation in the "mix" of American research and development.

The fragment from the editorial is: "the theory-to-practice sequence is not as rigorous as is common in the physical sciences and engineering." The

sentence from Seaborg is: "Today, about 12 percent of the federal funds for research and development are used to support basic research fields." The statement from the later issue is: "large-scale action programs have seldom been accompanied or preceded by pilot studies which evaluated the several alternative actions that appeared equally attractive."

In the physical sciences and in engineering, Seaborg notes, Americans spend some $8 in the "theory-to-practice sequence" for each $1 spent on theory, in contrast to the disregard of this aspect of effort in the behavioral sciences, as noted in the third sentence quoted. No, or few, test facilities or proving grounds in the behavioral sciences can be cited as counterparts of the tens or even hundreds supported in the physical and engineering sciences. Who is to say that if a comparable effort were made, comparable results would not be achieved?

It is a commonly accepted view that the behavioral sciences are not as far advanced as the natural sciences. The conclusion is sometimes drawn that this is the sole or a major cause of the less firm understanding, in practice, of behavioral than of physical phenomena. The "mathematical model" of this argument might run as follows: given curves f and g, where a point A of f is not on g and a point B of g is not on f, then f and g can have no point in common.

It should be clear that neither the conclusion nor the line of argument is espoused in any of the articles cited. Indeed, it appears that they justify, rather, the conclusion that in the "theory-to-practice sequence," as elsewhere, "you get what you pay for."

CLIFFORD J. MALONEY
601 Culler Avenue,
Frederick, Maryland

Genesis of Cancer

Despite its title, "Heritance of acquired characters," the recent article by Frank L. Horsfall, Jr. [*Science* **136**, 472 (1962)], is devoted largely to the relationship between viruses and cancer. I have no professional concern with that subject and no fault to find with factual aspects of the article. The title, the introduction, and some further remarks have, however, misleading implications for a field with which I am concerned —evolutionary theory.