Letters

Batteries in England

I was interested in the editorial comments [*Science* **123**, 1059 (15 June 1956); 1099 (22 June 1956)] to the effect that the "customer's" appraisal of a product can be very different from the scientific evaluation, and that the difference may persist even when the result of the scientific evaluation is known.

You may be interested in a small controversy over batteries that occurred in England in the early 1930's. A columnist in a radio magazine expressed the opinion that some 120-volt dry batteries, then on the market at 5 shillings (when the cost of a similar battery from a reputable manufacturer would have been about 12 shillings), could not be very good. By a simple piece of arithmetic he proved that it could not possibly be economic to market a carefully made battery at less than a penny per cell. In response, he got several letters from people who said that they were using such batteries in their radios with "excellent results" and suggested that "he must be in league with the manufacturers" of the more expensive batteries. He then tested the cheap battery by a series of intermittent discharges through a resistance, designed to represent the effect of ordinary use in a radio set, and compared its performance with that of a more expensive battery. For some weeks he gave in his column a blow-by-blow account of the test and clearly demonstrated that, although the cheap battery worked well at the beginning of each discharge period, its performance fell off rapidly toward the end, compared with the more expensive one, which was just what might have been expected.

The response to this was a crop of letters to the editor, claiming that the writers "had performed similar tests with much better results," etcetera, etcetera. One of them ended: "I think 'Thermion' must have chosen a dud." ("Thermion" was the pen-name of the columnist.) At this "Thermion" gave up the argument in despair, concluding that the intense desire of people to justify themselves (and to "prove" that the reputable manufacturers were making an excessive profit on their batteries) had clouded their judgment, both of the performance they were getting from their radios and of the results they claimed to have been getting on the test-bench.

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What Is Behavioral Science?

The expression *behavioral science* has come into use in recent years. This designation appears to be an outgrowth of the interest of the Ford Foundation in Program V, "scientific activities designed to increase knowledge of factors which influence or determine human conduct, and to extend such knowledge for the maximum benefit of individuals and of society." This area has been repeatedly referred to as "behavioral science" in more recent writings, and recently a journal with this name was founded.

Behavioral science would be equated by some to psychology. Besides limiting behavioral science unduly, this would not suit some psychologists, inasmuch as it would appear to overemphasize the behavioristic approach. The recently instituted journal is an interdisciplinary effort, for the editorial staff includes not only psychologists and psychiatrists but also a political scientist, a neurophysiologist, an economist, a mathematician, and an educationist. The interdisciplinary aspect of this venture seems clearly desirable.

The question that I wish to raise before the term *behavioral science* takes on an unfortunate restricted meaning is that of the status of genetics, biochemistry, and biophysics. My concern is not prompted by a desire to emphasize a mechanistic approach to the subject, but I have real misgivings about attempting to build a superstructure without any concern for the foundation.

It is no secret that the trend in the social sciences is environmentalistic. When it comes to an interdisciplinary study as broad as behavioral science, however, geneticists need to be called into action because no one can question but that there is an interplay between genetic and environmental influences, and that in order to understand either, one must understand both.

Behavioral science certainly has its roots in biology, and the foremost frontiers of biology lie in biochemistry and biophysics. To leave biochemistry and biophysics out of behavioral science is to be superficial and hedge it about on the basis of a priori assumptions which are quite unwarranted. It is preposterous in view of all we know to exclude nutrition and endocrine balances from the "factors which influence or determine human conduct." It would seem very unfortunate just when genetics is beginning to throw light on these subjects to invite it to stay out.

One of my own interests in this field is related not to the uniformity of human behavior but to the nonuniformities. It is interesting to know as much as we can about why people act alike, but it is also worth while (and crucial in my opinion) to know why people *do not behave alike*. Biochemistry has much to offer in the way of insight into this problem, as is brought out in a forthcoming book on *Biochemical Individuality*.

If biochemistry and genetics were minor disciplines and could contribute only in a trifling way to behavioral science, their exclusion would not be so serious. Very recently, in a principal address at the Chicago meeting of the American Psychiatric Association, Percival Bailey, a neurosurgeon, neurologist, and psychiatrist, indicated that future progress in dealing with mental disease is largely in the hands of biochemists. This bears out the crucial need for interdisciplinary study of behavioral science in which biochemistry is an important part. In line with this need, we have recently instituted, with the support of the Welch Foundation of Houston, a cooperative study at the University of Texas and the Austin State Hospital (for mentally ill) in an attempt to discover the biochemical roots of mental disease.

Roger J. Williams
Department of Chemistry and *Biochemical Institute, University of Texas, Austin*

I agree with the point made by Roger J. Williams. The term as it applies to the Center for Advanced Study in the Behavioral Sciences covers all scientific efforts directed toward an understanding of human behavior. Last year, the fellows of the center included three biologists. Among the current seminars is one on the biological bases of human behavior. One of the biologists who will be a fellow next year is a geneticist. Many scientists studying human behavior recognize the interdependence of biochemical, biophysical, and social factors. More

This department will appear occasionally. For suggestions concerning acceptable items, see the editorial in this issue.

studies in these areas are needed and should be encouraged.

Among the difficulties of unraveling these important interrelated factors are those of developing productive interdisciplinary efforts. Biochemistry and biophysics have developed after many years of unrelated work done by biologists, chemists, and physicists. Psychologists, anthropologists, and sociologists have increasing intellectual contact among themselves but carry on little intensive work with biochemists and biophysicists. I hope that the kind of cooperative study mentioned by Williams will be one of many which will pave the way for fruitful interdisciplinary work involving scientists from both biological and social fields.

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Postnatal Determination of Sex

It is a pity that John R. Baker could not have seen the 30 Mar. issue of *Science* before writing his excellent article on "English style in scientific papers," [*Science* **123**, 713 (27 Apr. 1956)]. I refer, of course, to the article on the detection of sex of fetuses [*Science* **123**, 542 (30 Mar. 1956)], specifically the sentence on page 543: "The sex of the newborn infant has been established on the basis of external physical examination." Out here, we use the colorimetric method: pink bootees = boy; blue = girl.

JAMES J. DOHENY
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To forestall other letters on this subject, the editors ask readers to note that the custom of using pink for boys and blue for girls is apparently not standardized: in some places, it is reversed.

Michurin, Vavilov, and Lysenko

As a supplement to G. L. Stebbins' recent report on the "New look in Soviet genetics" [*Science*, **123**, 721 (27 Apr. 1956)], I would like to draw attention to another article in *Botanicheskii Zhurnal* the Soviet Russian journal which also contained the material cited and discussed by Stebbins. This article [**40**, 752 (Sept.–Oct. 1955)] is written by P. A. Baranov and D. V. Lebedev on the occasion of the 100th anniversary of the birthday of Michurin and bears the title "Forgotten pages from the biography of I. V. Michurin: I. V. Michurin and N. I. Vavilov."

It is generally known to those who have followed the development of the "Soviet genetics" that Lysenko and his followers have claimed Michurin as their spiritual forerunner and have insisted that Michurin's work was not appreciated and was even suppressed by the "professional" geneticists. According to their story, it took the personal interest and intervention of Lenin to provide Michurin with adequate support for his work, and it later took the genius of Lysenko himself to recognize fully the significance of this work.

Baranov and Lebedev, however, show in their article that Michurin's breeding work not only had attracted the attention of "professional" botanists as early as the time of Czarist Russia, but that it was none other than N. I. Vavilov who initiated the support Michurin received in the last 12 or 15 years of his life. The two men first met in 1920, and Vavilov was sufficiently impressed with Michurin's achievements in fruit breeding to request a report and induce the government—quite likely Lenin personally, who at that time indeed took great interest in the improvement of plant breeding in Russia—to provide Michurin with an experiment station of his own and with adequate funds. The two men remained in contact for the rest of Michurin's life. Shortly before the latter's death, Vavilov sponsored his election to honorary membership in the Soviet Academy of Science.

Baranov and Lebedev emphasize that Vavilov did not agree with all of Michurin's ideas. There can indeed be little doubt that he had no use for the Lamarckian concepts in Michurin's theoretical work or for such notions as the "mentor theory," according to which compatibility of species, and so on, can be modified by graft union. But he was attracted by two features in Michurin's breeding work in which Michurin was without question ahead of most plant breeders of that time, namely, the use of species hybrids and the utilization of the world's resources of cultivated plants. The latter, of course, was one of Vavilov's own main interests, and Vavilov was ready from the first to recognize Michurin's practical accomplishments, such as the breeding of fruit varieties that could be grown in regions that nobody had ever considered for raising fruit.

On the other hand, Baranov and Lebedev cite passages from the writings of Michurin which show that Michurin was far from considering his theoretical contributions as something incontrovertible and final. On the contrary, he stated specifically, and on more than one occasion, that he did not claim to have refuted the laws of Mendel or the results of other geneticists, and that he might have made mistakes in interpreting these results. Somewhat naively, he added that he did not consider this very serious, since such mistakes would be corrected by future investigators.

Michurin died in 1935. In that year, Lysenko, although in the ascendancy, was still a long way from his peak of power. There is no evidence that he has rendered Michurin any actual service, direct or indirect. The only "service" he did render him was to elevate his theoretical notions—proposed in all sincerity, but not supported by any conclusive evidence—to the rank of Soviet biological gospel, thus making Michurin one of the bogus theoreticians of the Soviet system. For the support that Michurin, the successful plant breeder, received in the later part of his life, he was indebted to Vavilov, the man for whose death Lysenko bears the ultimate responsibility. The fact that Vavilov's part in Michurin's career can again be reported in a Soviet Russian journal is another proof of the "new look" in Soviet genetics.

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Role of Teachers in Scholarship Programs

On behalf of the Chicago Section of the American Chemical Society, I should like to comment on the letter from H. J. Bennett *et al.* on the "Role of teachers in scholarship programs" [*Science* **123**, 942 (25 May 1956)].

The Chicago Section has for the past 2 years sponsored a scholarship program in which high-school chemistry teachers, at least, far from being "completely overlooked," are recognized along with their students. The program consists of an annual competitive examination in chemistry for high-school students. Not only do the first five winners receive sums ranging from $100 to $700 that are applicable to college tuition and fees, but the teacher of each prize winner receives a cash award of $100. The funds for the awards are obtained through solicitation from industry by the section's Endowment Committee, and the examination itself is administered by the section's Education Committee.

No complicated entry forms or screening tests are involved. The teacher merely sends the names of not more than two of his students to the Chicago Section. About 200 students, representing about 150 teachers, have taken the examination each time.

We hope that the number of entrants and the size of the awards can be increased in the near future.

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