Letters

Test for Science Students

John Walsh in "Curriculum reform" (8 May, p. 642) correctly states that the College Entrance Examination Board provided a special test for high school physics students who were taught the course planned by the Physical Sciences Study Committee. The report, however, may give the impression that such a test is still being offered. The special test was introduced in 1959 and was offered in major College Board test administrations during a 3-year period.

The committee of examiners for the test, composed of three college professors of physics and two secondary school physics teachers, believed that several important purposes of a high school physics course were common to both PSSC and "conventional" courses and that a test measuring student progress toward these objectives could be developed that would be suitable for all physics students.

An experimental test of this type was prepared. Scores on the test correlated well with high school physics grades in several schools and with scores on either the PSSC test or the "conventional" test, whichever was appropriate. High school students who had not taken physics did not do well on the test.

A single test considered appropriate for both PSSC and "conventional" physics students is now offered at each College Board test administration. Many of the questions in these tests are based on material which is common to the two kinds of physics courses. For the rest of the test, there is a balance between questions based on material emphasized in one course and questions based on material emphasized in the other.

In chemistry and biology, studies made to date have not demonstrated the necessity for special tests for the new curricula. Offering a special test in a national testing program seems an easy answer to the testing problems that emerge during curricular reform. Guiding students to the correct test, however, is difficult. Most students from a "conventional" course have no idea that a new course exists and do not know that they have taken what curriculum experts may call a "conventional" course. Furthermore, for use in college admissions the same score on two tests in physics, for example, should indicate the same level of achievement in physics. Such equivalence is not easily obtainable.

The committee of examiners for the College Board chemistry test is moving toward a test of the type which has been found acceptable in physics. A study is being initiated to determine whether separate tests are needed for students taking the Biological Sciences Curriculum Study course and for students taking conventional courses.

In each of the three fields, additional data are obtained each year in order that the examiners for the College Board science achievement tests can make appropriate decisions about the number and the nature of the science tests offered in the College Board program.

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Skinner on Theory

In his effort to attribute a "remarkable complacency" in behavioral science to my views on scientific method, Bixenstine ("Empiricism in latter-day behavioral science," 31 July, p. 464) seriously misrepresents my views on theory. He cites two papers (giving, incidentally, page references to the wrong book. He is referring not to *Science and Human Behavior* but to *Cumulative Record,* enlarged edition, Appleton-Century-Crofts, New York, 1961). In one of these papers I object to theories of learning which attempt to explain observed facts by appealing to events "taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions." I had in mind the "grand" theories of Hull and Tolman mentioned by Bixenstine. I argued that these men had been forced to imagine a theoretical process not visible in the data because their data were too disorderly to satisfy certain preconceptions of order, and I pointed out that when improved experimental methods generated behavioral facts showing a high degree of regularity, the need for such theories was greatly reduced. Bixenstine cites a paragraph from the conclusion of that paper without noting that the next sentence reads: "This does not exclude the possibility of theory in another sense."

The second paper he cites was not only not a preachment or the advocacy of a particular style of research, it was significantly titled "A case history in scientific method." In it I reviewed as honestly as I could my own history as an experimental psychologist. I was concerned with showing that it did not exemplify the pattern of research which was at that time almost universally taught to students of psychology as scientific method. I said that I had never

> behaved in the manner of Man Thinking as described by John Stuart Mill or John Dewey or in the reconstruction of scientific behavior by other philosophers of science. I never faced a Problem which was more than the eternal problem of finding order. I never attacked a problem by constructing a Hypothesis. I never deduced Theorems or submitted them to Experimental Check. So far as I can see, I had no preconceived Model of behavior, certainly not a physiological or mentalistic one and, I believe, not a conceptual one.

The paper concluded with the following paragraph:

> We have no more reason to say that all psychologists should behave as I have behaved than that they should all behave like R. A. Fisher. The scientist, like any organism, is the product of a unique history. The practices which he finds most appropriate will depend in part upon this history. Fortunately, personal idiosyncrasies usually leave a negligible mark on science as public property. They are important only when we are concerned with the encouragement of scientists and the prosecution of research. When we have at last an empirical account of the behavior of Man Thinking, we shall understand all this. Until then, it may be best not to try to fit all scientists into any single mold.

In another paper reprinted in the same collection, I insisted that the important trend in experimental psychology was "toward a satisfactory theory of behavior."

I have not observed the remarkable