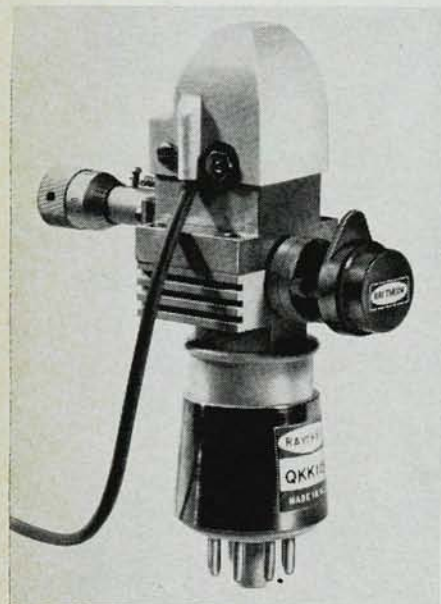


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be to accept only articles that are in accord with some predetermined (and announced) criterion of *completeness* in the development of a definite "thesis" that is *new* and is exploited sufficiently in terms of mathematical development and comparison with experiment to make a bona fide, convincing case for the objective reader. Generally, then, such articles should be based on long, careful investigations, covering as many as possible of the avenues that follow from the central thesis. Because of the nature of such articles, the journal should not be inundated with countless manuscripts.

I hope the existence of such a journal would induce researchers to carry their investigations much further than is customary today before the results are written up. The journal could also relieve some of the burden on other journals that are now flooded with short articles on the initial stages of theoretical and experimental studies.

In addition to the requirement of *completeness*, the only criteria that should be used to judge the acceptability of a manuscript for the proposed journal should be *originality*, *logical consistency* and *mathematical consistency*. I propose that if the reviewing staff of the journal found an article that satisfied those four criteria

—regardless of whether or not its central thesis departed from the thinking of the majority of researchers—the journal would be obliged to accept the article for publication.

I feel that such a journal would indeed aid the individualist by giving him a voice—on condition that he had not only speculated but also followed through with a rigorous mathematical and experimental development and had made sufficient comparison with the properties of nature. In addition to the possible relief that such a journal might provide for other AIP journals, it might also, in the long run, help reduce the tensions of the "publish-or-perish" policy in many institutions by relieving the pressure on scientists to publish results of their studies while the studies are still in the preliminary stages.

I hope that my fellow members of The American Physical Society, and members of the other AIP societies, will consider these proposals to aid the individualist by ensuring and facilitating, as far as possible, his freedom of inquiry in present-day science. I hope that this column might be used for further discussion of these and other suggestions to this end.

Mendel Sachs
Boston University

Is physics too tough? Some comments on our April editorial—

All my experience indicates to me that undergraduate physics as taught in many American colleges and universities is too tough in several ways, and that the responsibility for this situation generally lies in two directions. First, there is the regrettable circumstance that section teaching in the large general course is often delegated to inexperienced graduate students, many of whom regard such an assignment as a menial chore to be completed with as much dispatch as possible so they can get back to matters they consider more important.

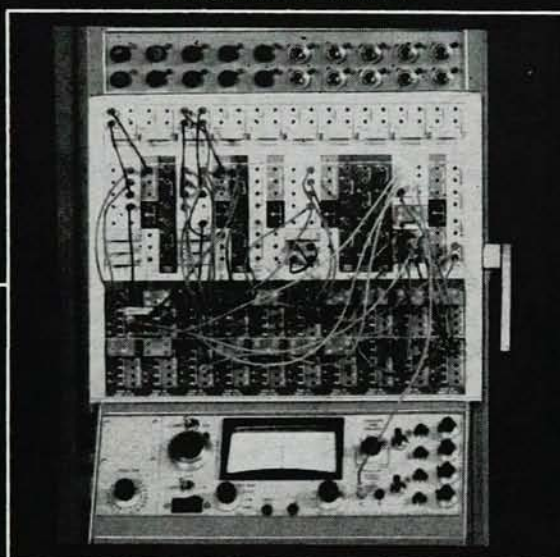
More mature staff members, who should know better, frequently harbor the same kind of resentment and unconsciously take it out on the hapless student by expecting him to acquire something of their own degree of seasoned understanding of

the subject in a year's struggle with far too much detailed, strange material. This kind of teacher is likely to give quizzes and examinations consisting exclusively of numerical problems. He is the one who boasts, "We show them that we mean business by flunking about 25 to 30 per cent each year." A mean business, indeed.

Second, if the situation seems disturbing in connection with prospective majors in physics and other sciences, it is even more alarming with respect to students in other fields. These students, it is generally agreed, should gain some real acquaintance with science as part of their general education—the now-famous "two cultures" theme. Here the difficulties are increased by the highly miscellaneous backgrounds and preparation of the prospective learners and by a preva-

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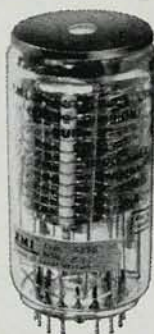
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lent fear of—in some cases antipathy toward—science.

Happily, in a number of institutions where interested and capable staff members have been allowed to initiate and develop special programs for nonscience students, the results have been encouraging. Much more experimentation and innovation is needed. The main thing is that administrators and staff members must convince themselves that such efforts are respectable and worth while.

James Clerk Maxwell's words, expressed a century ago, are as pertinent as ever: "For the sake of persons of different types, scientific truth should be presented in different forms and should be regarded as equally scientific, whether it appears in the robust form and vivid coloring of a physical illustration, or in the tenuity and paleness of a symbolic expression."

Ira M. Freeman
Rutgers University

I am wondering whether the time has come to hope that some small steps could be taken to modify our present attitudes. It seems to me that something might be done at the high-school level to make physics courses less frightening. There are, of course, many reasons why high-school teachers tend to set their goals very high and to try, for example, to cover all of the PSSC material in their courses. But I think one of the principal sources of pressure is the college-entrance examination.

Suppose the college-board examination in physics were limited to some rather small fraction of the usual coverage. Presumably every high-school course could easily cover this minimum material in perhaps one third of the average course. After this material was covered, the high-school teacher would be free to go as fast or as slow as his own and his students' capabilities dictated. It might even be possible to persuade high-school teachers that the physics course should be graded in a more relaxed way than usual to avoid scaring students away from physics.

Although I concede that the direction we have been taking with the PSSC curriculum is correct, the

program has been far too ambitious and the net result has been seriously damaging to physics and other science in this country. For most high-school students, physics taken at the usual pace is very difficult compared, for instance, with mathematics. I am therefore unimpressed with the attitude that students should be pushed hard and fast in physics in high school. I would much rather see physics aimed more directly at students who will not go on in science, and let physics for science students at the high-school level be primarily a holding operation to maintain their interest. I would much rather see time spent on increasing the mathematics background at the high-school level.

Arthur F. Kip
University of California (Berkeley)

Could we have some discussion in the columns of your journal on the so-called "forced flunk" and related practices in education in the physical sciences? I have been told by a dozen students at a large state-supported college that in the basic physical-science courses, no more than half of any class is permitted to go on to a succeeding semester regardless of the quality of their work; they are so informed by their instructors. A class of 40 in freshman chemistry, they say, is normally down to five or six students by the beginning of the second sophomore term.

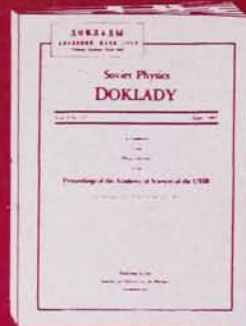
Similarly, many engineering and physics students and recent graduates have observed to me that, on the average, it now takes 4.5 years or more to fulfill the requirements for a bachelor's degree.

These "get tough" policies are not announced to the public nor explained to high-school counselors, so far as I can find. Yet it appears that they must exist.

Lawrence T. Fleming
Pasadena, Calif.

Physicists, for the most part, seem to have a certain callousness about the uninitiated. This attitude is surely self-defeating. Our premise is that beginning students interest themselves in physical phenomena rather than in physical abstractions. Professionals seem to do the reverse, for

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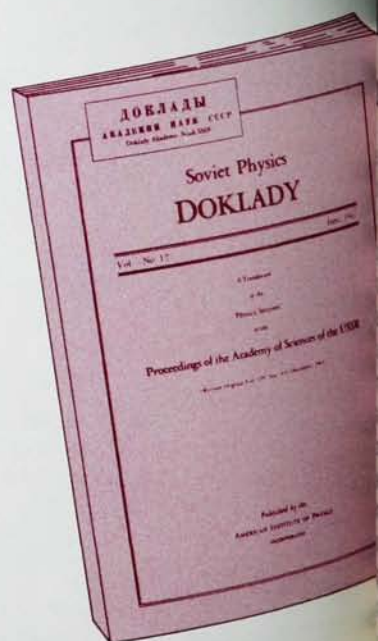
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good and proper reasons, in advancing physical knowledge. The intolerance of one for the other causes frustrations that are difficult to overcome.

H. Craig Sipe

George Peabody College for Teachers

The American Society of Mechanical Engineers has asked its members to comment on engineering curricula. Two of my comments are as follows:

- Is there too much non-essential course work in present curricula? One example is mathematics. It has been noted that after leaving college, well over 90% of the graduate engineers never use mathematics more complicated than elementary calculus and probably 80% never use calculus.

- Are some courses of very little use to graduate engineers? Probably the best example is physics. This course, extremely fundamental to engineering, has been changed from a wonderful set of physical concepts to a mathematical mumble-jumble. It is no longer useful in the main stream of an engineer's thinking but only as a specialized thought pattern to be used on certain occasions.

Our youngest daughter recently completed a high-school course in physics. It was a "tough" course and she obtained high grades. The sad thing was that she did not learn anything significant about heat, mechanics, sound, electricity or magnetism, but [she did learn] some "new approaches" to nuclear phenomena, plasma physics, astronomy and elementary-particle physics. She had enough of physics and still doesn't know what happens when water freezes or boils.

Maurice Nelles

*Westinghouse Electric Corp.
Baltimore, Md.*

A correction: We regret the following typographical errors in the letter by W. B. Lewis published last month: The name "Leland" should be "Leland" and "Lamour" should be "Larmor." In the next-to-last paragraph, "... from this theory (by then current) ..." should be "... from this by theory (then current) ..." In the last paragraph, "... distribute as in ..." should read "... distribute as if. . . ." □