Letters

The Planet Pluto

In view of the nature of the letter published under the title "Pluto not a planet?" [*Science* **123**, 896 (18 May 1956)], I wish to make the following statements.

Within the last year I have publicly discussed the origin of Pluto on two occasions, both incidental to a general discussion on the origin of the solar system: on 12 November 1945 for the Royal Canadian Institute at Toronto, and early last February at the National Science Foundation in Washington, D.C., at the Conference of Geophysics. The full text of the first talk is being published in three parts, two of which have appeared [*J. Roy. Astron. Soc. Can.*, Nos. 2, 3, 4 (1956)]. The Washington talk was briefer but was attended by a reporter from Science Service, who asked me a few supplementary questions on Pluto the next day. No other interviews were granted, although three or four further inquiries by telephone were answered. These facts show the absurdity of the first part of the letter of 18 May.

It may be that Science Service overemphasized the Pluto story in their release to the newspapers; at any rate, some silly headlines resulted. It seems ironical that my assistance rendered to Science Service should lead to the 18 May letter in *Science*. What is one to conclude from this for one's further conduct?

The comment was made that Lyttleton had already suggested Pluto's origin as a satellite of Neptune; this item is covered by my article. The explanation of Pluto's having been lost from Neptune by the almost complete evaporation of the protoplanet "should not be confused with Lyttleton's hypothesis that Pluto and Triton were initially both satellites of Neptune and then had a close encounter, which caused Pluto to leave the system and Triton to become retrograde. There is no reason to suppose that an encounter between regular satellites has ever occurred; and there are five retrograde satellites other than Triton." Two further articles on this problem, one by E. K. Rabe and one by myself, are in press, showing that the Jacobi constant of Pluto's orbit in the system Sun-Neptune confirms my hypothesis on the origin of Pluto and contradicts the earlier suggestion.

GERARD P. KUIPER
Yerkes Observatory,
University of Chicago
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Secondary-School Science Teachers

John Mayor's editorial "Credit in education?" [*Science* **123**, 919 (25 May 1956)] should not pass unchallenged. There is probably general agreement regarding the need to prepare more teachers of science and mathematics, to induce the present teachers to remain in the teaching profession, and to improve the competence of those not adequately trained either in subject matter or in teaching techniques. Improved salaries, improved teaching facilities, and added prestige and status for the well-trained teacher will help.

Some of the assumptions expressed in the third paragraph of Mayor's editorial are especially disturbing. Since one of the present needs is to add to the feeling of competence of the teacher, this can best be met by added course work in the subject-matter field and, to some degree as well, by special courses in teaching problems in that subject matter. This need for added competence and the feeling of having obtained it are quite separate from the problem of whether the courses taken do or do not yield graduate credit.

I would urge that a part of the STIP program of the AAAS be devoted to promoting among school boards and any other controlling agencies, including legislatures when necessary, the notion that increased competence earned through taking appropriate courses be recognized and rewarded by increased salary. Since school boards already recognize such added competence as accrues from *present* graduate courses and *present* master's programs, I suggest that it would be grossly improper to mislead them by radically changing the "rules" regarding credit level. It would certainly be naive, at best, to assume that school boards and superintendents would be unaware of the changed quality and nature of the course work submitted, and they could be expected to react vigorously to the changes. Further, it is unlikely that a teacher will acquire more prestige next year by taking an introductory science course for graduate credit than by taking the same course today for undergraduate credit, even though the same courses offered for graduate credit might have "more satisfactory enrollments."

Colleges and universities, however, must not merely resist pressures to downgrade graduate credit in subject-matter and teaching-problems courses; they must also seize the opportunities to encourage prospective teachers. Where staff, student-body size, and finances permit, they should establish such subject-matter courses as may best help the teacher or prospective teacher (as the STIP recognizes).

There is one more imperative in this program. Since the high-school science teacher will, over the years, be the interpreter of scientific research to the largest part of his community, he must have some firsthand experience with research. This can be obtained through his own M.S. thesis work, or it can be obtained as a part of a research group concerned with faculty or other advanced graduate student work. Planning for this program must be a prime concern of our colleges and universities. Only when our secondary-school teachers can appropriately interpret science and scientists to our growing public will real respect and understanding of science come in this country. This, too, will add to the prestige of the science teacher.

JERRY J. KOLLROS
Department of Zoology, State
University of Iowa, Iowa City

The letter of Jerry J. Kollros is another encouraging indication of the genuine concern of scientists about the quality of science teaching in secondary schools. There is agreement on the part of scientists, of educationists, and of secondary-school teachers that a great many teachers of science and mathematics in secondary schools need added course work in subject matter. The disagreement comes, of course, on the best ways of meeting these needs, so well stated in the letter from Kollros.

All can also agree that the *need* for added course work in subject matter is quite separate from the problem of graduate credit. Here, the basis of disagreement arises from the question of the reasonableness, or even the desirability, of expecting teachers to meet this need by taking undergraduate courses in science. Salary schedules, based on graduate