# 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.

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22 June 1956

## 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.

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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

credit, present one deterrent. Registration in freshman and sophomore courses with much younger students, some of whom may be former students of the teacher enrollee, presents another. Questions, sometimes embarrassing, from colleagues and friends back home become still another. In our secondary schools, as in our colleges and universities, the degrees earned by a staff member are important to the teacher's status and, indeed, to his self-respect.

There is almost universal agreement that the status of teachers in the community and the recognition of the importance of their work for the national welfare should be generally enhanced. The National Education Association and other professional organizations of teachers are working toward the essential goal of the general recognition of teaching as a profession. Graduate credit and the master's degree provide objective evidence of professional and personal achievement. Although this may not be wholly dependable, these objective measures are in a sense comparable with the objective measure of grades earned, also not wholly dependable. Teachers should be encouraged to seek this kind of evidence, in addition to many other kinds of evidence, of their professional accomplishment.

No one seriously proposes that graduate credit be given to teachers for a regularly offered undergraduate course, particularly at the freshman or sophomore levels. If a teacher finds that he has been assigned to teach a physics class, and he has had no work in college physics, he should, in practically all cases, be required to take the first college course in physics. The teacher who has had some undergraduate work in physics, possibly a major in physics 20 years ago, or perhaps 10 or 15 hours in physics 2 or 3 years ago, is in a different situation. Quite a number of colleges and universities are finding it possible to offer special subject-matter courses in science and mathematics for teachers which carry graduate credit, usually to be counted only toward a master's degree in science teaching. Prerequisites for these courses include teaching experience and, usually, some undergraduate course work in the subject. Although the content might be of a scientific level lower than that in other graduate courses leading to the master's degree in the science and to research, it has still been found possible to offer such courses at a reasonably respectable level. The danger of "downgrading graduate credit in subject matter" by this practice seems to many less serious than the danger from a situation in which teachers, who may be weak in subject matter, continue to take all of their graduate work in education.

The Science Teaching Improvement Program has tried, and will continue to try, to promote the acceptance on the part of controlling and influential agencies at the national level of the principle "that increased competence earned through taking appropriate courses be recognized and rewarded by increased salaries," as is urged by Kollros. This activity has been supplemented by support and encouragement given to efforts to bring about the highly desirable goal of merit salary increases for teachers. As of 1 August 1955, there were 27,992 high schools in the United States. The influence of the Science Teaching Improvement Program directly on salary schedules of this very large number of schools is of necessity negligible. Scientists throughout the country can assist by making their views known to school boards in their own communities, and they can be encouraged in these efforts by the example of the good work now going on at the local level in the Washington area.

In disagreement with Kollros, it seems safe to assume that members of school boards and school administrators will readily accept the definition of graduate credit by colleges and universities. These people, devoted to the welfare of the schools, surely would welcome adjustment in traditional patterns of science offerings, which are planned specifically to increase the competence of their teachers. The change in quality and nature of the course work would be welcomed as a change to better quality for the particular job and need of their teachers.

The endorsement of Kollros of first-hand experience with research for secondary-school teachers is highly commendable. This sound proposal points out another way in which scientists in higher education can make a real contribution to the improvement of science teaching in our schools.

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## Meriones

I have noted the article regarding a new laboratory animal, *Meriones libycus,* in *Science* [**123**, 790 (1956)]. The following information regarding other species of *Meriones* may be of some interest.

In 1952 at a Symposium on the Leptospiroses sponsored by the Veterinary Division, Walter Reed Army Institute of Research, Washington, D.C., J. Van der Hoeden reported that a rodent belonging to the group *Meriones* and native to Israel had been found to be extremely susceptible to infection with *Leptospira.* These rodents (*M. crassus sacramenti*) and the smaller type gerbil *M. shawi*) have been used in Van der Hoeden's laboratory for the isolation of *Leptospira* from suspected materials since 1950. In a recent report [*J. Infectious Diseases* **95**, 213 (1954)], Van der Hoeden recommended *M. crassus sacramenti* as a valuable test animal for both routine and research studies of *Leptospira.* Several pair of this species were obtained from Van der Hoeden's laboratory in Israel by the Leptospira Research Unit of the Communicable Disease Center in December 1954. Unfortunately, breeding has been unsuccessful.

A colony of *M. unguiculatus* has been established at Tumblebrook Farm, Brant Lake, N.Y., for commercial production. According to Floyd and Hoogstraal [*J. Hyg.* **52**, 516 (1954)] and others, the *Meriones* will breed under laboratory conditions, but the smaller gerbil (*Gerbillus pyramidium*) and the jerboa (*Jaculus orientalis*) do not breed in captivity.

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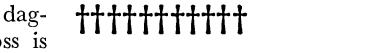
## Crucifix and Dagger

Charles F. Richter's letter entitled "Dangerous dagger" [*Science* **123**, 723 (27 Apr. 1956)] confuses the crucifix with a dagger. Perhaps he could claim justification by referring to Louis IX of France, Saint Louis, who is said to have made his sword a cross by holding it aloft by the blade. I believe that American printing custom is to use first an asterisk as a reference mark and next the dagger (sometimes called an obelisk). The cross as used by the continental printers in obituary notes and to indicate posthumous publications has no relation to the religious beliefs of the deceased but is a mark of respect. Respect is certainly not implied by the American custom of putting "deceased" in a footnote. The continental printer's cross is not pointed like a dagger.

In the catalog of French monotype faces before me (Ets. J.-B. Abrate, 153, Boulevard de la Gare, Paris—XIII), I find neither the asterisk nor the dagger, but the cross is figured among the "signes" (see figure). Even in the small type size, the lower limb is not pointed. I have seen the pointed cross in German heavy (bold) Gothic type face titles, for letters and characters with a straight bottom do not exist in this type face. The same German pages will carry a regulation cross in the text, printed in a Roman type face.



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