dividuals have had similar experiences with the same journal. This practice raises serious questions concerning publishing ethics. Over and above the injustice to particular authors is the problem of journal credibility in general. Historians of science in particular must find this practice unsettling, since it raises questions as to which misinterpretations or mistaken nuances in an article are those of the author in question and which are those of an anonymous editorial assistant.

It is difficult for individuals to monitor such problems of publishing ethics or to alert the scientific community to this or similar problems of which it may be unaware. It would appear there is a real need for some scientific organization to establish a mechanism for the investigation of problems in the ethics of scientific communication.

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Rabies Shots

In his Research News report of 28 December 1973 (p. 1329), Thomas H. Maugh II writes that "individuals who have been exposed to rabies or whose jobs or hobbies open them to exposure (veterinarians and spelunkers, for example) normally require a series of 14 to 21 daily injections of rabies vaccine to produce immunity. . . ."

It is true that authorities urge "high-risk" individuals, such as animal handlers, to get preexposure rabies vaccinations. However, this initial series of injections involves only two to four shots spread out over 2 weeks to 6 months. Anyone who has had preexposure vaccinations and who possesses sufficient antibodies need only receive one to six injections if subsequently bitten by a known rabid animal. It is neither recommended nor necessary for anyone except unvaccinated persons who have been significantly exposed to rabies to have "14 to 21 daily injections."

The advisability of preexposure rabies vaccination has not been widely accepted by scientists and by others who work with animal species that could potentially expose them to rabies. Part of this reluctance is because of the misconception that the initial series involves 14 to 21 daily injections.

As Maugh states, the new Wistar vaccine will probably reduce the vaccine side effects and may someday allow even further reduction in the number of injections necessary both before and after exposure to rabies.

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Definition of the Meter

It may be useful to follow up on my letter (29 June 1973, p. 1321) on the speed of light and its implications, or lack thereof, for the study of the solar system. The following passage is excerpted from a resolution adopted by the International Astronomical Union (IAU) at its General Assembly in 1973 (*1*).

> The International Astronomical Union . . . recommends that when the most precise value of the speed of propagation of electromagnetic radiation in vacuum is required, the value proposed by the Consultative Committee for the Definition of the Meter . . . , namely $c = 299\ 792\ 458$ meters per second, should be employed, . . . and that the International Committee of Weights and Measures *maintain this value in any redefinition of the meter* [italics mine].

The last phrase carries the clear implication that the meter is to be redefined as a specified number of light-seconds, thereby reducing it to a secondary unit. There has been some confusion over the motivation, even the propriety, of doing this. The lone negative vote cast among the IAU members present was due to concern over the "legislation of constants of nature."

Of course, there is nothing of the constant of nature about the meter or any measure related to it. It was originally defined, after all, as an arbitrary fraction of the circumference of a small planet whose primary astronomical importance consisted of its being the habitation of all known astronomers. Nothing could be more ad hoc. The present conventional definition is based on a transition wavelength of krypton, which may be more accessible, but is hardly an improvement in principle. At the time of its adoption, this definition seemed safe enough, but its freedom from ambiguity was only assumed. It apparently did not seem important that both the meter and the

speed of light were measurable in principle, or that such measurements might be incompatible with the defined second.

Now, because of advances in laser technology and measurement technique, a new definition of the meter is required. It would be preferable to eliminate the problem by rethinking the fundamental concepts rather than simply adopting a new convention after the manner of the old concept.

The speed of light has recently been measured in at least three independent experiments in which different techniques were used. The internal consistency between these determinations is more than an order of magnitude better than the precision with which the conventional meter can be determined. The latter has nothing to do with measurement technique, but rather relates to an ambiguity in the actual krypton line. While it is possible to redefine the meter more sharply, this would only leave the same problem for a future time. The adoption of a conventional speed of light in vacuum, in combination with a defined second, implies a meter not subject to change in principle. It has the happy effect of throwing all of the uncertainty into one's knowledge of the actual length in meters of any physical distance, such as an electromagnetic wavelength, the length of a bar of platinum, or the distance to the moon. The uncertainty is purely one of measurement, not of definitions, and is thus much more satisfactory to an orderly mind.

The value for c recommended by the IAU is, of course, that which is most compatible with the current definition of the meter, so no discontinuity would be introduced by its adoption.

Some persons have interpreted my earlier letter as a call for the use of the light-second as the sole unit of distance. That was not my intent. While this unit should be regarded as the most fundamental one, as a result of the techniques now used for all high-precision measurement, it is inconvenient in some contexts. Secondary distance measures, such as the astronomical unit, the meter, and the angstrom, still have an important place in science.

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1. *I.A.U. Trans.*, in press.