wanted to voice an "objection" talked about the energy of a *solar flare* and the spatial attenuation at earth's distance from the sun, declaring that one of my numbers was therefore very wrong. The relevance of solar flare energy to the geomagnetic storm energy confined to the geomagnetic cavity surrounding the earth is about as small as the sun's distance from the earth is large. At most, we can say that the sudden influx of charged particles from the sun triggers geomagnetic storms—their energy is to the energy of the storm as the detonator energy is to the energy released by the bomb it activates.

There had already been all too much acrimony, back-biting, and anger expressed in the symposium—and too many long-winded replies to comments from the floor. For me to launch into a lecture explaining the difference between the sun's solar flare and the earth's geomagnetic storms to one who either knew it already or would never know it, while all others present wanted to get on to more meaningful discussion of real questions raised by my presentation, seemed inappropriate. I hoped that most others present knew this was my meaning in refusing to enter into heated or lengthy dialogue with an individual whose zealous opposition to Velikovsky outran his reason.

IRVING MICHELSON
Department of Mechanics and Mechanical and Aerospace Engineering, Illinois Institute of Technology, Chicago 60616

Metrication as Cultural Adaptation

Constance Holden's report "Metrication: Craft unions seek to block conversion bill" (News and Comment, 5 Apr., p. 48) reveals that the monopoly of a single point of view on metrication has been broken. The National Bureau of Standards' 1971 report (*1*), with its vague "decision whose time has come" theme, assumes no rational alternative to a wholesale attack on the present measuring system as a prelude to "conversion," a term not without religious connotations. I hope the stand of the craft unions can open up a serious analysis rather than a shouting match.

In historical perspective, the present system is not outdated; it is rather the survivor in a process of cultural adaptation. In the United States we have had a mixed system ever since Ferdinand Rudolph Hassler introduced the standard meter in the early 19th century. Those units and proportions which were well adjusted to use have survived, as in the 5280-foot mile as the side of a section of land (*1*); and those which did not have useful associations, as in apothecary medicine, have seen the metric system gain ascendancy. The prompt shift to a decimal coinage as distinct from other weights and measures at the beginning of the republic is instructive. The solution was not to start de novo but to choose a traditional unit that was already familiar—the Spanish dollar—and to divide it both into decimal fractions of 100 cents and also into "bits" by the halving sequence—½, ¼, ⅛—which is at the root of many of the ratios in traditional measurement. The British could have profited from looking at our experience when they came to decimalize their coinage, but they have evidently chosen to enter metrication without benefit of history.

That we can liquidate the adaptations of many centuries in 10 years is inconceivable, as is the suggestion that we shall not continue to select our measuring units and processes adaptively into the indefinite future. The carpenters are right to oppose metrication, not only because of their tool boxes, but because the measuring system to use on an artifact with least cost in information is the one by which it was designed. Carpenters in Providence, Rhode Island, have to repair houses 200 years old, and even such new technologies as nuclear engineering have used a mixed system.

Both the proponents and opponents of metrication should cease the present inelegant debate and seize the opportunity to make the United States the first country genuinely at home using two or more measuring languages. We now have enough computing capability and enough technically trained sectors of the population that we can aspire to a more sophisticated solution than wholesale conversion of the population by the unlikely instrument of the public schools. A preferable metrication program might include the following elements.

1) Adopt the objective of a population capable of using more than one measuring language. The use of international units on a world scale and the ability to apply them locally would be a major part of this objective.

2) Measure the costs and benefits of any change in terms of gain and loss of information. The dollars gained and lost would thus become a function of continuing process, not a one-time-only change to be borne by a few business and age cohorts. Protection against the destruction by blind authority of an individual's cultural heritage expressed in the information he or she has internalized and can use is a basic human right. By the same token the younger generation should not be deprived of the ability to understand the artifacts which surround it.

3) Emphasize the locating of boundaries either where computer capability exists, or where people must be brought to a high level of technical training anyway (as in the case of pharmacists). The land on which a particle accelerator rests can most efficiently be registered at the courthouse in terms of sections, acres, and feet. Yet scientists would be as ill-used as the carpenters if they were required to adopt anything but international units in making their measurements. A boundary between the traditional system and the international system somewhere between land and instrument should be carefully defined within the organization.

4) Teach children in public schools how to measure and also how to select the appropriate system. The person who takes a picture of a football game on a 100-yard gridiron with a 35-millimeter camera is already thinking in both systems with little loss of information and a low index of confusion. The schools should start from there to teach the next generation to choose the appropriate measuring language rather than take on the impossible job of destroying one culture and substituting another. The information costs of the latter program are disastrously high in terms of obscuring the realties of our technological heritage.

A. HUNTER DUPREE
Department of History, Brown University, Providence, Rhode Island 02912

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