Letters

Mycoplasma Contamination

Tritium-labeled uridine is supplied by a number of manufacturers in the form of a "sterile aqueous" solution. On three separate occasions during the production of murine leukemia viruses by repeated harvesting of fluids from virus-producing roller-bottle cell cultures over periods of 1 week or more, I found that cultures fed [^{3}H]uridine in media developed mycoplasma infections. These cultures showed decreased cell growth, increased amounts of "debris" in their fluids, and a striking decrease in yields of virus. Cultures fed identical media without [^{3}H]uridine did not develop these characteristics. Mycoplasma were subsequently isolated directly in two out of two trials from previously unopened vials of sterile aqueous [^{3}H]uridine used in the above experiments. The contaminated compound was purchased from a large manufacturer. Isolations were made from a single lot, but a prior isolation from cell-culture fluids strongly incriminated another lot from the same manufacturer. I have not yet tested other lots from the same or other manufacturers and have not yet species-typed the isolate.

Because of the widespread use of [^{3}H]uridine in RNA studies, including those I have described for the purpose of obtaining highly purified oncornaviruses and their RNA's, investigators should be alerted to the danger of mycoplasma contamination of their labeled viruses, cells, and of their laboratories, from this compound. These findings have been related to the chairman of the Ad Hoc Committee on Radioactive and Isotopic Specifications of Labeled Compounds of the International Union of Pure and Applied Chemistry, who in turn has notified the manufacturer. Until the extent of the problem is defined, I would advise heat inactivation of sterile aqueous [^{3}H]uridine before use.

GEORGE C. LAVELLE
Carcinogenesis Program,
Biology Division,
Oak Ridge National Laboratory,
Oak Ridge, Tennessee 37830

World Food Shortage

Roger Revelle (Editorial, 14 June, p. 1135) uses as his text: "Give us this day our daily bread" in an eloquent plea for action on world grain shortages. He calls for a world food bank, modernized agriculture, and more research. He also urges reducing rates of population growth. But is there anything that can be done at once to increase world grain supplies?

If the U.S. government were to establish an educational program to avoid food waste, an increase in available food supplies could be obtained at no cost in natural resources, productive manpower, land, or environmental assets. Such a program, guided by nutrition and agriculture experts, biologists, demographers, and others, could make it possible for us to provide significant amounts of our food supplies to those starving in Africa and Asia.

In particular, government influence should be used to encourage production of exportable cereals rather than feedlot grain (over 60 percent of the grain we produce is fed to cattle, another 30 percent is exported, largely for fodder, and only 7 percent is used to feed our people). Advice should also be offered to the public about the amount of protein needed in the daily diet and the available sources—other than "feedlot meat"—thereof. There are endless ways to conserve grain if the government could be induced to act in the national and world interests and overcome the opposition of those whose "oxen" would be gored. The scientific community could supply the impetus for such a program by providing persuasive data.

ROBERT F. ROTHSCHILD
John Stuart Inc., 205 East 58 Street,
New York 10022

Revelle's editorial is good, as far as it goes. He proposes that it is "absolutely essential" to reduce rates of population growth and to produce more food if we are to avoid the "precipice" of mass starvation. This is quite true, but Revelle does not mention the possibility that, in order to avert disaster, we may try very hard to do *both* of the necessary things, but succeed in doing only *one*.

Almost every year, mankind produces more food than the year before. This is an area we know a lot about, and it is something everybody wants to do. Revelle makes several suggestions that might further improve the agricultural picture.

However, even if we continue to increase food production, we will still have the population problem to solve. For this, we need to bring about a rapid and very substantial drop in the world birth rate—something that we have never been able to do. We don't know how to do it, and most people seem to care very little about the problem.

At the moment, it appears that we are going to try to do both of the things Revelle suggests. What will be the probable result? Food supplies will increase modestly, but world population will increase by 100 million people each year. This is not postponing disaster; it is incubating catastrophe.

JUSTIN BLACKWELDER
The Environmental Fund,
1302 Eighteenth Street, NW,
Washington, D.C. 20036

Revelle's excellent editorial points out valid basic problems that relate to food supplies today and tomorrow. However, it overlooks the more important factor—"How do we live?"

Those in the field of agricultural research have often been guilty of overlooking the ancient phrase, "Man does not live by bread alone." The real question is not how many people the world can feed, it is how many people the world can support in a life worth living. Aspects of the high standard of living we enjoy in this country are envied by people around the world. However, many of them could care less about imitating us.

I have devoted nearly 25 years of teaching and research to increasing the food production of agricultural crops through modern soil and water conservation practices. But I have insisted that my students realize that increasing our present food supplies will only buy us time, and that time seems to be running out.

A common fallacy often promoted around the world is that mechanization of agriculture will increase production. In most of the developing countries, where labor is abundant and cheap, this is not true. Mechanization can

increase efficiency tremendously, but often it adds little or nothing to total production.

We must also realize that soil, like any other resource, must be used within limits or it is destroyed. If it is used properly, it is a provider of a renewable natural resource (annual agricultural crops). However, if it is destroyed, it takes centuries to restore it. With our present rate of population growth, such restoration would be impossible.

It is true that the United States is now the breadbasket of the world, but looking to agricultural research to solve the problems of the future is keeping our heads buried in the sand. We in agricultural research should give full recognition and increased support to our co-workers in population control, because eventually our success depends wholly upon theirs.

ARTHUR E. PETERSON
Department of Soil Science,
University of Wisconsin,
Madison 53706

I agree completely with Rothschild that a program of nutrition education, coupled with wide dissemination of understanding about the best uses of America's agricultural productivity, could be very helpful as one part of the solution to the problem of world hunger.

Blackwelder and Peterson both emphasize the urgency of reducing rates of population growth. This can be humanely accomplished only by lowering human fertility, and we are beginning to learn some of the necessary conditions. There is growing evidence that the needed reduction of birth rates in the less developed countries depends, at least in part, on improving the conditions of life of the poorest 60 percent of the people and on giving them realistic hopes for the future. Most of these people depend on agriculture for a livelihood, and a large increase in agricultural production would be a major step in the right direction. Rapid population growth in many poor countries seem to be as much a consequence as a cause of human poverty and misery.

In reply to Peterson's comments about agricultural mechanization, it should be pointed out that some kinds of mechanization will increase both food production and employment. For example, irrigation water from mechanically or electrically powered wells and cultivating equipment which will allow rapid seedbed preparation often make it possible to grow a second or third crop during the year. Other kinds of mechanization do tend to reduce direct employment on farm fields, but insofar as they help to increase agricultural production and farmers' incomes, they are likely to result in more total employment in rural areas. Exactly this seems to have happened in some of the "green revolution" areas of the Punjab in India, where, by the way, the age of marriage of women rose by about 4 years, and birth rates declined by at least 20 percent during the past decade.

ROGER REVELLE
Center for Population Studies,
Harvard University,
Cambridge, Massachusetts 02138

Thermal Energy Units

It appears that the pressure to convert to the use of the metric system in the United States has mounted to the point where adoption is inevitable in a very few years. Many of the more vigorous proponents of conversion may not be aware of all the complexities involved. Presumably the basic reason is to provide for international interchangeability of nuts and bolts. It is inferred that the metric system is good because it is logical. That is not the case. It is good because it is decimal and because unity conversion factors exist between sundry simple units of length, volume, and weight (or mass).

It is assumed that conversion to the metric system will require that we abandon all of the more complex terms of the English system, including the important units, the horsepower and the Btu (British thermal unit). The horsepower can conveniently be supplanted by the kilowatt, and simple and obvious conversion factors to basic units such as the watt and the joule can be retained. The unit of thermal energy involves a much more complicated issue, since it is arbitrarily defined in *both* the English and the metric system and in a manner such that conversion factors are difficult to remember.

In the light of the energy crisis of today, it might be well to examine the confusion of terms which are currently employed in discussions of energy problems. The petroleum expert thinks in terms of barrels of crude oil or millions of cubic feet of natural gas. The electrical engineer thinks in terms of kilowatt-hours. The heating experts think in terms of Btu's. Scientific expressions for energy involve a bewildering array of numerical conversion factors, even within the metric system. For example, the joule equals 0.239 gram calorie, and 1 kilowatt-hour equals 860 kilogram calories (and frequently the kind of calorie is not specified). Interrelation with the English system adds more confusion: 1 kilowatt-hour equals 3413 Btu's, 1 Btu equals 251.98 gram calories, and 1 Btu equals 1054.8 joules. It is rare to find even a technically oriented person who can instantly recall these conversion factors.

If we are to change our measurement system, I suggest that we consider changing the definition of the unit of heat, the villain in the above confusion. Adoption of the meter-kilogram-second system in place of the classical centimeter-gram-second (cgs) system resulted in a one-to-one relation between the expression for energy in scientific and practical units, that is, 1 newton-meter equals 1 watt-second. A one-to-one relation between the basic units of energy in the mechanical and electrical energy systems was thereby established. It would be most convenient if the basic unit of the thermal energy system had a one-to-one relation with the basic units of other energy systems.

I propose a new unit called the "herg," which would be an amount of energy equal to 1 joule, 1 newton-meter, or 1 watt-second. A herg would be equal to the quantity of heat required to raise the temperature of 1 gram of water 0.2388°C (or whatever string of significant numbers could be agreed upon). The kiloherg would be equal to approximately 0.95 Btu, and therefore the commercial unit of heat might well become the megaherg, perhaps contracted to mherg or mhg—an energy unit equal to 0.278 kilowatt-hour.

The name herg is proposed for obvious reasons. The cgs unit of work—the erg—has been, in effect, abandoned. Since it was presumably merely a contraction of the world energy, a revival with the prefix letter "h" might be highly appropriate. It might even be more in keeping with past practice in assigning names to units of physical measure to name the new unit the Carnot, honoring one of the most eminent figures in thermal theory.

C. H. LANPHIER
Sangamo Electric Company,
Springfield, Illinois 62708