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Cultured lymphocyte lines can be derived from patients with genetic deficiency diseases and inborn errors of metabolism with a high degree of success (8).

Recent investigations indicate it will be possible to hybridize cultured lymphocytes with both human and mouse cultured cells or cells taken from blood or other organs (9).

If you are interested in the "new" molecular biology, we would be pleased to share our research with you and provide you with a bibliography of current references.

Start answering the new questions. Write, call or visit ABS for information on the "new E. coli."

2. Glade PR, Chessen LN; Int Arch Allergy 34:181-187, 1968
Keeping power generating equipment operating at capacity, especially during periods of peak demand, is vital. To insure against downtime, a new tool from HP can "look inside" key machinery and predict when it will need service or maintenance.

"Transformation Machine" converts fuzzy signals into sharp answers for power systems.

One user of the HP 5450 Fourier Analyzer acquired it after spending 18 frustrating months on a central computer trying to develop a method for the identification of load and machine characteristics in a power system. In his own words: "The 5450 makes practical the use of mathematics to do things that scientists and engineers have wanted to do for 20 years. Using a central computer isn't satisfactory. It takes too long and you cannot see the results during your experiment. With the 5450 you can 'play' with the measurement signal to find out what's really going on. One session with the 5450 is worth 3 to 4 months on the central computer."

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LETTERS

Use of Energy

In his editorial, “Continuing increase in use of energy” (21 May, p. 795), Abelson notes five fundamental problems of our present economic system. The system will have to be redesigned to solve these problems if the aims of his editorial are to be realized.

1) Present incentives (profits, corporate growth, and so forth) operate to encourage high consumption, such as product proliferation, product inflation, rapid obsolescence, high turnover, and high waste. The incentives are weak that operate to satisfy needs with maximum efficiency, minimum inputs of labor and materials, and lowest real or long-term cost.

2) Progress in the direction indicated implies institutional restructuring that would displace many people from their present jobs. Can the system adapt smoothly without widespread disruption, maldistribution, unemployment, and economic depression?

3) How can the system handle the situations where the logic of “Tragedy of the Commons” or “tyranny of small decisions” operates? For example, my private decision to turn off unnecessary lights in my house is hardly influenced at all by the thought of the few cents saved. Yet the actions of millions of people thinking that way add up to a ponderable result. Electricity would have to cost much more to make me act differently; it is likely to cost less. And if it is deliberately made to cost much more, who gains? Similarly, when I decide to drive my car to work or hitch a ride with a friend, I do not take into account that my decision is helping to destroy a public transit system or a railroad that some other day I may want to use. It is widely believed that the system of private choice in the marketplace handles all these situations. The fact is that in many of them it breaks down. What kind of redesign will fix it?

4) The market system does not arrive at the best allocations if the relative prices of goods do not reflect their total real costs. Furthermore, study of many pollution cases shows that even a proportional distribution of the “total social cost” into the selling price or an industry’s taxes will not accomplish the desired result, because of the presence of decision-making processes of the type previously discussed.

5) The system excessively discounts the future. This problem is implicit in Abelson’s concern about rapid consumption “at ridiculously low prices” of nonrenewable resources. The “discounted present value” criterion for the use of capital resources, at high interest rates, leads to some patently bad decisions, which can impose escalating costs of another kind on our descendants.

R. W. JACKSON
Science Council of Canada, Ottawa 4, Ontario

A switch to low-sulfur natural gas and fuel oil would have implications for agriculture, since a considerable amount of the sulfur needed by crops comes from atmospheric sources. Soil and plant analyses and field experiments in many areas of the world show that sulfur is a limiting nutrient element in crop production, particularly in nonindustrialized regions. There has also been a significant decrease in the sulfur content of fertilizers in recent years (1). Direct absorption of atmospheric sulfur dioxide by crops and plants has contributed significantly to the sulfur nutrition of crops.

In cleaning up the air, due allowances will need to be made for the removal of one unsought bonus of air pollution—the millions of tons of sulfur that are released annually into the atmosphere.

P. K. HANLEY
Soils Division, Agricultural Institute, Johnstown Castle Agricultural College, Wexford, Ireland

Reference

Ecology

“There are no such people as ecologists. I don’t know what ecology is. Ecology is a word; it isn’t a science. It is the sum of all the sciences that must be brought to bear on the totality of the biosphere, so I am told.

“When I looked around at ecology a few years ago, the best that the ecologist, so-called, could hope to do was to understand the processes in what he called the ‘terrarium’ . . . or perhaps a goldfish bowl . . . and suddenly they wish to make extrapolations to Lake Erie or the totality of the grass lands of the United States.”

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is merely a formal attempt to emphasize the obvious; the second, that it is a legitimate enterprise but must be deferred until we know a lot more than we do. I cannot help being reminded of Pepys’ account of Charles II scoffing at the men of Gresham College wasting their time trying to weigh air. This chimerical business, we should note, led to the discovery of oxygen, the founding of modern chemistry, and plant and animal physiology a century later.

It may clear matters somewhat to modify the usual definition of ecology as the science of interrelation between life and environment. Actually it is a way of approaching this vast field of experience by drawing upon the best information available from whatever source it may come, with precise experimental control where possible, of course, as in the superb watershed studies of Herbert Bormann and his associates. But one cannot, for example, interpret the ecology of a deciduous forest, an urban complex, or the East African plains, while ignoring their history, despite the imperfections of the record. Geology, too, has had to face this problem and survive skepticism, which is confined today to the Fundamentalists.

The fact that a great deal of ecologically indispensable work is being done by those who do not call themselves ecologists does not validate an indictment of the profession as incompetent to deal with anything more significant than goldfish bowls.

It is the special responsibility of the ecologist to discover, assemble, and interpret whatever is pertinent and sound. Often, as by Frederic Clements, Sir Arthur Tansley, Patrick Geddes, and Charles C. Adams, this charge has been powerfully and effectively met.

Paul B. Sears
Las Milpas,
Taos, New Mexico 87571

Linear Algebra Problem

With respect to Bosch’s article “Redwoods: A population model” (23 Apr., p. 345), I wish to inform Bosch, the editors of Science, and its referees that they have all just failed elementary linear algebra (see Technical Comments, p. 435).

Mitchell Taibleson
Department of Mathematics,
Washington University,
St. Louis, Missouri 63130

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