Letters

Disease Control

The general approach that Cohen (18 June, p. 1212) advocates for cancer research is an improvement over the old idea that if we simply let loose enough investigators with enough money, then all of our health problems will be solved. That idea was too much akin to the notion of the economic invisible hand that would in the long run effect the best allocation of resources. As Keynes put it, "in the long run we are all dead" (*1*). But Cohen does not go far enough. As he says, we need "well defined goals, programs and priorities," but we need them not merely for cancer research. We need them for the overall problem of disease control.

One approach would be to emphasize those diseases that (i) account for the greatest premature mortality, (ii) have the greatest morbidity in terms of seriousness and number of patients, and (iii) have the best prospects for alleviation. In the United States the four most important causes of premature death (at age 75 or less) are heart disease, cancer, accident, and stroke. In terms of duration, probably the most important single cause of morbidity is mental illness, specifically schizophrenia and depressive psychosis. Ranking diseases in terms of prospects for alleviation is much more difficult (although the drug treatment of psychosis has been relatively more successful than the chemotherapy of cancer—neither of them are very good). In any case, fundamental biological research, while of unquestioned importance for the understanding of disease, is but one aspect of the problem of disease control. Historically, there can be little doubt that the most important single factor in the control of fatal disease has been prevention. Prevention in turn has depended much more on epidemiology than on cell biology. The most important single element in the control of most fatal diseases would still seem to be prevention; we should therefore allocate a relatively greater effort to prophylaxis than to basic biological research. It doesn't make sense to shortchange screening programs that might eradicate cervical cancer while greatly expanding research into the molecular biology of cancer. There is no assurance that understanding cancer will mean curing cancer. Nor is it rational to spend $7 million in a problematical effort to treat sickle cell anemia, while denying $5 million to control lead poisoning, a disease that can be virtually eliminated.

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Reference

1. J. M. Keynes, *Monetary Reform* (Harcourt, Brace, New York, 1924), p. 88.

Rubella Vaccine

One point in Eichhorn's article (Research Topics, 20 Aug., p. 710) might be misinterpreted by the reader. It is correct that the rubella vaccine, RA 27/3, is not yet licensed in the United States and that the experimental studies in this country have been done with small groups. However, the vaccine is in use under license in Great Britain, France, and elsewhere. More than 200,000 people have received RA 27/3 vaccinations.

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Contamination of Distilled Water

I was intrigued by the report of Favero *et al.* (27 Aug., p. 836) concerning the growth of naturally occurring *Pseudomonas aeruginosa* in distilled water, and some questions "naturally occurred" to me. What were the concentrations of phosphate, nitrate, and organic carbon in their distilled water? How do these concentrations compare with those in high-quality deionized water? To what extent did the glassware contribute to the inorganic nutrients?

I would guess that an "on-line" water treatment system consisting of an ion-exchange cartridge, an activated charcoal cartridge, and a membrane filtration cartridge for sterilization would produce higher quality water and would be more convenient than "fresh" distilled water. The use of disposable plastic containers might further reduce the phosphate contamination.

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Thomas raises several questions to which we also would like to have answers. We have not yet undertaken any extensive organic or inorganic chemical analyses of distilled waters that support the growth of our naturally occurring strain of *Pseudomonas aeruginosa.* Chambers and Clarke (*1*) have reported that bacterial growth occurred even in specially prepared water (that is, in an all glass still with H_2SO_4 and $KMnO_4$, filtration, and condensation), and resulted in cell concentrations up to 4×10^4 per milliliter. They also stated that the absence of bacteria in distilled water may be a basis for suspecting that the distilled water contains toxic material.

We have yet to examine a sample of distilled water in which *P. aeruginosa* will not grow regardless of how the water was prepared. As we pointed out, *P. aeruginosa* grows more slowly and reaches a lower maximum population in freshly collected distilled water than it does in the same kind of water that has been aseptically stored for several days. We have assumed that the carbon and nitrogen sources originate primarily but not exclusively in the air. In addition, it is known that *P. aeruginosa* can use a variety of organic compounds as carbon sources even when they are present in only trace amounts.

Although the "on-line" water treatment system suggested by Thomas may give a product of higher chemical quality and be more convenient than the use of conventionally prepared distilled water, most hospitals continue to use distilled water, storing and dispensing it from containers others than disposable plastic ware. As we pointed out, we were trying to reflect a situation that would "naturally occur" in most

hospitals. In this sense, waters of any sort in the hospital environment have the potential of becoming massively contaminated with pathogens.

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Reference

1. C. Chambers and N. Clarke, *Advan. Appl. Miacrobiol.* **8**, 105 (1966).

Approval of Research Grants

We continually hear that with restricted funding or research grants the young scientists do not fare well in competition with the older, more established ones. On several occasions various institutes at the National Institutes of Health have made studies of the rate of approval of applications from younger scientists and how it compares with the rate of approval of applications from older scientists. The rate was always about the same for both groups.

I have made a study of the applications that were presented to the National Advisory Heart and Lung Council at its June 1971 meeting. The council reviewed 458 applications, 88 of which were from investigators age 35 and under and 372 of which were from those age 36 and over. The rate of approval for the younger group was 66 percent (57 were approved); the rate for the older group was 58 percent (217 were approved). The funds anticipated in June 1971 for fiscal year 1972 would support only 45 percent (39) of the younger group and 34 percent (126) of the older group.

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Radar System Dismantled

An extraordinarily complex radar system called MAR (multiple array radar) became operational in 1964 at White Sands Missile Range; it was designed to detect incoming missiles for national defense. The receiver of this radar was made up of approximately 2500 separate, circularly polarized, switched elements, each with its own wide-band, low-noise, parametric amplifier. Beam switching by means of aperture synthesis was completely controlled by computer. Such arrays are usually switched manually and never include the luxury of a low-temperature front end.

The aggregate cost of this radar was approximately $160 million. It was an incomparable instrument, operating near the 21-centimeter line for beam-switched observations of distant radio sources and possibly even of supernovas in distant galaxies. Its cost was greater than all the radio astronomical facilities that have been built in this country and possibly in the world. It was three times as expensive as the VLA (very large array), the largest radio astronomy telescope ever proposed.

The MAR radar was dismantled before a proper evaluation could be made of its astronomical capability. Regretfully, we at the New Mexico Institute of Mining and Technology performed the dismantling and salvage without access to the specifications of the ability of the whole system. It is a tragedy indeed that such a short-term military experiment could not have been made available to astronomers who could have made measurements that now may not be made for many decades. Fortunately, 2000 parametric amplifiers were salvaged, and 280 have been presented for use by radio telescopes throughout the world. These alone significantly improve the quality of many instruments.

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Degree of Fact

The scale that Celsius proposed had water boiling at 0° and freezing at 100°, so the official recommendation (see Letters, 19 Feb., p. 628) that the centigrade scale should be called Celsius is even dafter than your correspondents point out (Letters, 9 July, p. 105). A centigrade thermometer with 0° as the freezing point of water was made, however, by Pierre Martel of Geneva in 1742 (*1*).

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Reference

1. D. J. Bryden, *Brit. J. Hist. Sci.* **5**, 393 (1971).

Human Environment Conference

In a report (News and Comment, 29 Oct., p. 480) about the United Nations Conference on the Human Environment, to be held next year in Stockholm, Robert Gillette writes that I "said that admittance to the proceedings in Stockholm is open to 'member states only' and that therefore Taiwan would, in all probability, be barred."

The question of participation in the Conference on the Human Environment is a matter for decision by the U.N. General Assembly at its current session. I said that invitations to states to participate in the conference would be issued in accordance with the decision of the general assembly.

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Botany's Future

I would like to offer my support for the timely and accurate editorial by Philip H. Abelson (18 June, p. 1195). When *Science* can clearly recognize the atrophy that has characterized much of the last two decades of American botanical history, it is possible to hope that the long trend of the deterioration of botany will cease and reverse its course. Faddism and unbalanced federal funding have played a role in that deterioration. It is time that biologists, scientists, government officials, and the public recognize that botany is not a stepdaughter science. Not only should funding institutions increase research allocations for existing and new botanical work, but universities should consider that academic "reorganization" has rarely benefited botanical science (*1*). Finally, may the enormous botanical wealth of the tropical regions of the world begin to receive the same kind of attention that has been given that of the temperate and arctic regions. The recent establishment of a botanic garden and herbarium at the University of Malaya is one step in that direction.

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Reference

1. W. H. Eshbaugh and T. K. Wilson, *BioScience* **19**, 1072 (1969); W. L. Stern, *Plant Sci. Bull.* **15**, 1 (1969); S. Greenfield, *ibid.* **16**, 6 (1970).