LETTERS
Animal Feeds: Effect of Antibiotics: J. D. Dingell; Analytical Chemistry Techniques: J. M. Petruzzi; Multiyear Funding Authorization: L. C. Allen .......................... 1069

EDITORIAL
What to Expect from Gerontological Research?: F. C. Ludwig .................. 1071

ARTICLES
Spaceborne Imaging Radar: Geologic and Oceanographic Applications: C. Elachi .................................................. 1073
Phospholipid Methylation and Biological Signal Transmission: F. Hirata and J. Axelrod ............................................. 1082
Research and Development, Productivity, and Inflation: E. Mansfield ........... 1091

NEWS AND COMMENT
Doubts Mounting About All-Volunteer Force .................................. 1095
Briefing: Rational Suicide; Not What You Know but Where You’re From; House Report Nails AEC for Sheep Deaths .................. 1096
Is There a Catch to Innovation? ...................................................... 1098
Nitrites: FDA Beats a Surprising Retreat .......................................... 1100
NAS and Sakharov ................................................................. 1100
DNA: Chapter of Accidents at San Diego ........................................... 1101

RESEARCH NEWS
Vaccinating with Bacterial Pili ......................................................... 1103
Cornell Evidence for Fifth Quark ..................................................... 1105

AAAS NEWS
Summer Meetings: Pacific Division, AAAS Affiliates, and Interciencia; Call for Nominations: 1981 General Election; ANZAAS Holds Jubilee Congress; Proposals and Resolutions Invited for 1981 Council Meeting; AAAS
Membership Recruitment Concerns: Carol L. Rogers; CSFR Meeting; Science and the Public of Interest to Chinese Delegation; 1979 AAAS Summary
Financial Statements ................................................................. 1107

ANNUAL MEETING
Science and Technology: Bridging the Frontiers ................................ 1111

BOOK REVIEWS
Zoogeography and Diversity of Plankton, reviewed by B. W. Frost; Comparative Studies of the Courtship and Mating Behavior of Tropical Araneid Spiders, B. D. Opell; Secondary Plant Products, G. R. Waller; Cellular Interactions in Symbiosis and Parasitism, J. J. Lee; Books Received ................................................................. 1112

REPORTS
Mount St. Helens Ash from the 18 May 1980 Eruption: Chemical, Physical, Mineralogical, and Biological Properties: J. S. Fruchter et al. ................. 1116
Composition of the Mount St. Helens Ashfall in the Moscow-Pullman Area on 18 May 1980: P. R. Hooper et al. ................................................................. 1125
Gravitropism in Plant Stems May Require Ethylene: R. M. Wheeler and F. B. Salisbury ................................................................. 1126
J Genes for Heavy Chain Immunoglobulins of Mouse: N. Newell et al. ...... 1128
Electrical Stimulation of the Midbrain Mediates Metastatic Tumor Growth: R. H. Simon et al. ................................................................. 1132
Flavin Adenine Dinucleotide-Dependent Monooxygenase: Its Role in the Sulfoxidation of Pesticides in Mammals: N. P. Hajjar and E. Hodgson ..... 1134
Serial Female Sex Changes After Simultaneous Removal of Males from Social Groups of a Coral Reef Fish: D. Y. Shapiro ................................................................. 1136
Alterations in Brain Norepinephrine Metabolism Induced by Environmental Stimuli Previously Paired with Inescapable Shock: G. Cassens et al. .......... 1138
Contextual Effects in Infant Speech Perception: P. D. Eimas and J. L. Miller ................................................................. 1140
Gastrin Injected into the Lateral Hypothalamus Stimulates Secretion of Gastric Acid in Rats: B. L. Tepperman and M. D. Evered .................... 1142

Eruption of Mount St. Helens, 18 May 1980, 8:32 a.m., Pacific Daylight Time. Data are from NOAA/6, orbit 4635, about 90 minutes later, supplied by National Environmental Satellite Service, Redwood City, California. Image produced by IBM Scientific Center, Palo Alto, California. See page 1116 and box on page 1124. [First-time publication courtesy of IBM, © IBM 1980]
What to Expect from Gerontological Research?

While disease control is a rational goal of scientific endeavor, the wisdom of controlling natural aging can be questioned. Such a goal would be as unrealistic as the expectation of limitless development in a world with limited resources. What, then, should we expect from research on aging?

Aging, although a profound concern of mankind, still escapes definition. Some biologists claim that the asymptomatic decline experienced as aging is the integrated expression of familiar but unrecognized disease entities. If this were so, any prevention of a chronic disease could be viewed as a modification of age: a man demonstrably protected against prostatic cancer or osteoarthritis could claim to be younger than those at risk, even if their chronological ages were the same. Others object that the incidence of chronic disease is not randomly distributed over the life-span: beginning with the fourth decade it increases exponentially, suggesting the existence of a time-dependent, irreversible process predisposing to but not identical with disease. If there were such a process, common to all cells or organs, lethal conditions occurring from adulthood onward would be mere complications of a ubiquitous disorder. To identify and manipulate this disorder at will carries the potential of a true panacea that would enable us to do away with a multitude of specific, costly, but purely symptomatic approaches to treatment. It is puzzling that contemporary medicine lacks both the observational data and the conceptual tools to decide conclusively between these alternatives.

To measure biological age represents another formidable challenge to research. At present, the biological age can be assessed only by quantitating its epiphenomena. It is a statistical entity that cannot be measured like temperature or weight. Age-related lesions progress at widely different rates. A small number of them kill before a majority of others become clinically significant. Only lesions of the first group enter human experience as actual diseases, those of the second are viewed as mere symptoms of age. Some of them are sufficiently quantifiable to allow an assessment of the organism’s biological age, but this always involves assumptions. What is called for—first in the experimental animal and then in the patient—is to achieve a verifiable discrepancy between the biological and the chronological age of individuals.

To the extent that medicine will be able to control the leading causes of death, slowly evolving diseases now experienced only in their subclinical stages will reach proportions that warrant medical attention. It would follow that, contrary to the prophecies of Huxley’s Brave New World, man will never die from old age alone but always from disease. However, terminal disease of the future will be different from that we are faced with now and, presumably, more diversified.

Contemporary medicine cures or prevents damage wrought by the environment. It achieves this by neutralizing pathogens or by compensating for the lack of something the environment normally supplies. Even genetic disease is dealt with in this fashion, be it by intercepting some environmental trigger or by prosthetic means. Medicine’s thrust is ecological. Man himself remains beyond its reach. But with increasing age, the causation of disease shifts away from the environment to originate more and more in the organism itself. At the same time, man’s capability to counter this intrinsic pathogenesis by ecological means, which has been so effective up to now, is approaching its limits, in spite of further sophisticated (and socially consequential) advances. Medical care, one might say, remains in its infancy as long as it cannot forestall intrinsic pathogenesis as effectively as that originating in the environment. To overcome this limitation is the true aim of gerontological research. In initiating the revolutionary step from an environmentally oriented health care to one centered on man himself, it becomes the very foundation of future scientific medicine.—Frederic C. Ludwig, Department of Pathology, College of Medicine, University of California, Irvine 92717