

## American Association for the Advancement of Science

### BOARD OF DIRECTORS

Paul M. Gross, *Retiring President, Chairman*  
 Alan T. Waterman, *President*  
 Laurence M. Gould, *President Elect*

Henry Eyring	Mina Rees
H. Bentley Glass	Walter Orr Roberts
Don K. Price	Alfred S. Romer
	William W. Rubey
Paul E. Klopsteg	Dael Wolfe
<i>Treasurer</i>	<i>Executive Officer</i>

### VICE PRESIDENTS AND SECRETARIES OF SECTIONS

MATHEMATICS (A)	
Magnus R. Hestenes	Wallace Givens
PHYSICS (B)	
Elmer Hutchisson	Stanley S. Ballard
CHEMISTRY (C)	
Milton Orchin	S. L. Meisel
ASTRONOMY (D)	
Paul Herget	Frank Bradshaw Wood
GEOLOGY AND GEOGRAPHY (E)	
John C. Reed	Richard H. Mahard
ZOOLOGICAL SCIENCES (F)	
Dietrich Bodenstern	David W. Bishop
BOTANICAL SCIENCES (G)	
Aaron J. Sharp	Harriet B. Creighton
ANTHROPOLOGY (H)	
David A. Baerreis	Eleanor Leacock
PSYCHOLOGY (I)	
Lloyd G. Humphreys	Frank W. Finger
SOCIAL AND ECONOMIC SCIENCES (K)	
Kingsley Davis	Ithiel de Sola Pool
HISTORY AND PHILOSOPHY OF SCIENCE (L)	
Adolph Grünbaum	N. Russell Hanson
ENGINEERING (M)	
Clarence E. Davies	Leroy K. Wheelock
MEDICAL SCIENCES (N)	
Francis D. Moore	Oscar Touster
DENTISTRY (Nd)	
Paul E. Boyle	S. J. Kreshover
PHARMACEUTICAL SCIENCES (Np)	
Don E. Francke	Joseph P. Buckley
AGRICULTURE (O)	
A. H. Moseman	Howard B. Sprague
INDUSTRIAL SCIENCE (P)	
Alfred T. Waidelich	Allen T. Bonnell
EDUCATION (Q)	
H. E. Wise	Herbert A. Smith
INFORMATION AND COMMUNICATION (T)	
Foster E. Mohrhardt	Phyllis V. Parkins
STATISTICS (U)	
Harold Hotelling	Morris B. Ullman

### PACIFIC DIVISION

John P. Tully	Robert C. Miller
<i>President</i>	<i>Secretary</i>

### SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Anton H. Berkman	Marlowe G. Anderson
<i>President</i>	<i>Executive Secretary</i>

### ALASKA DIVISION

Allan H. Mick	George Dahlgren
<i>President</i>	<i>Executive Secretary</i>

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

555-83370

718

## Technicians, Equipment, and Originality

Research mores are changing radically with the times. With the shift in attitude toward research from indifference to almost idolatry, there has come financial backing. And money has a powerful chemotactic effect, even on scientists. American science must "double and redouble" in size and strength, as several official reports have recently put it.

One reason for concern is the increasing growth of complexity, number, and cost of instruments and the growth in number, but decrease in capacity, of technicians. Instruments and technicians may, I suggest, reduce seriously the creativeness and originality of the young investigator. Before he has had the experience of being a naturalist, a man with his butterfly net, he is cast into a world consisting of a laboratory full of modern apparatus and two technicians who know how to do reliably almost nothing.

How can investigators keep the possibilities of fresh and creative approaches open for study? My suggestion is simple and, I am sure for many, simple-minded. When a young man starts his research, let him get his butterfly net out and put his thinking cap on. Sit down with the problem as it exists in nature—see and feel the problem—then decide how it can best be solved. With simple equipment and a clear plan, first he should try some preliminary orienting experiments with his own eyes and hands, not those of a technician. Then he should buy, or design, the necessary equipment and hire the technicians who may accelerate the work. Thus a problem might get solved, instead of just a paper being written.

Sir Alexander Fleming didn't have the benefit of modern instrumentation, a dishwasher, and a statistician to tell him what he had found. The latter, of course, could only tell him whether the results were "significant." I suspect Sir Alexander knew this already, don't you?

Am I trying to say that too much money is being spent on research? No, I am not. You must remember that research was a tenement-type operation just 15 years ago, and it takes time and money to clean out slums. Many laboratories need renovation, and many need rebuilding, and new ones need to be started. The total budget for research is still very small compared with items in the total budget of the United States, especially when you ruminate on how some of it is spent.

But the amount of money is not as important as how it is spent. I have touched on one problem. There are other problems such as the bigness of institutions, the tyranny of departmentalization, administrative rights, and responsibilities; the problem of expertness in mendicancy and problems of the ethics of science.

Neither scientists nor administrators have given much attention to the environment in which science is to grow. Until we are willing to give serious attention to these problems, we are not in a position to say "how much?" How much depends on what you have in mind. What I have in mind is to create a research environment in which originality thrives and technicians, equipment, and money are contributors—not roadblocks.—IRVINE H. PAGE, *Research Department, Cleveland Clinic, Cleveland, Ohio.*