

PHILOSOPHICAL LIBRARY BOOKS

INTRODUCTION TO ELECTRICAL APPLIED PHYSICS by N. F. Astbury. A book on physics and engineering, reflecting the development of electrical science into a subject which is neither physics nor engineering, but a combination of both. Brings together the classical basis of the subject and specialist topics which are entering all fields of applied science. Numerous diagrams. \$10.00

GALACTIC NEBULAE AND INTERSTELLAR SPACE by Jean Dufay. The most complete account available of the many diverse phenomena, observational and theoretical, involved in the study of interstellar matter. Illustrated. \$15.00

HIGH-SPEED SMALL CRAFT by Peter du Cone. A well-known designer of high-speed marine craft discusses the factors governing problems of design and construction, including rudder design, use of reinforced plastics and light alloys, propelling machinery, and use of models for predicting behavior in rough water. 44 plates & 140 drawings. \$15.00

ENGINEERING STRUCTURAL FAILURES by Rolt Hammond. A survey of the causes and results of failures in over a century of engineering, including earthworks, dams, harbor works, buildings, bridges, and underground works; with special consideration to failures due to vibration, earthquake, subsidence, and in welded structures. \$12.00

REASON AND CHANCE IN SCIENTIFIC DISCOVERY by R. Taton. Dr. Taton examines the relative role of active purpose and chance in the processes of scientific discovery. Steering clear of theory, he illustrates his thesis by practical examples drawn from the lives and works of such distinguished scientists as Poincaré, De Broglie, Bernard, Galileo, Roentgen, Becquerel, the Curies, Leibniz, Newton and others. Illustrated. \$10.00

CONSTRUCTING AN ASTRONOMICAL TELESCOPE by G. Matthewson. A detailed guide book for the expert as well as the beginner. Second revised edition. Fully illustrated. \$3.75

DICTIONARY OF MATHEMATICS by C. H. McDowell. A concise definitive dictionary for students and the general reader. Many illustrated examples. \$2.75

HISTORY OF MATHEMATICS by Joseph E. Hofmann. In a wealth of detail Professor Hofmann explores the number systems and methods of ancient peoples, the role of the great translators of the Middle Ages, the problems and tensions of the Scholastic period. Numerous works of Renaissance and Early Baroque mathematicians are discussed, emphasizing developments which helped to pave the way for modern concepts. \$4.75

ERNEST RUTHERFORD: ATOM PIONEER by John Rowland. Lord Rutherford will be remembered most for his brilliant and revolutionary research into atomic physics, and as the result of his work, rapid progress was made towards the development of the atomic bomb, the building of power stations, and the utilizing of atomic energy for industrial purposes. Illustrated. \$4.75

ELECTRONIC COMPUTERS by T. E. Ivail. A non-mathematical introduction to the mechanism and application of computers employing valves and transistors. Both digital and analogue computers are covered, the bulk of the book being devoted to describing their circuitry, while their rapidly developing applications in industry, commerce and science are also outlined. In the final chapter, the future evolution of computers is discussed. 40 drawings and 25 photos. \$10.00

ELECTRICITY AND MAGNETISM by J. Newton. A detailed study of the phenomena and theory of electricity and magnetism. The author deals with current electricity, electrostatics, magnetic properties of materials, magnetometry and thermo-electricity, concluding with a survey system of units, electronic circuits and elementary atomic physics. The author is Senior Lecturer in Physics at Northampton Polytechnic, London. 4 plates, 261 figures. \$10.00

SURGEONS ALL by Harvey Graham. The thrilling story of a thousand and one surgeons, beginning in prehistoric times, continuing through the great civilizations of Egypt, China and India, Greece and Rome, and down through the Middle Ages to the present day. In this inspiring tale of man's ceaseless struggle with disease and death, body-snatchers rub shoulders with princes, mountebanks and witches jostle famous surgeons. The account of the rise, fall and renaissance of surgery ends with a forecast of the astonishing prospects for the future. Numerous illustrations. \$10.00

CLASSICS OF BIOLOGY by August Pi Suner. This Survey of the Study of Life, told by one of the foremost living biologists, illuminates the high-points of progress in this science by fascinating glimpses into philosophical theories throughout the ages until reaching our present-day observational methods. The author is a former President of the Academy of Medicine in Barcelona. \$7.50

ORIENTAL MAGIC by S. I. Shah. The first book in any language to correlate the magical tradition and techniques of the West with those of the Middle and Far East. The author is President of The Oriental Cultural League. Illustrated. \$7.50

MAIL THIS COUPON TODAY

Mail to your favorite bookseller or directly to
PHILOSOPHICAL LIBRARY, Publishers
15 East 40th Street, Desk 2, New York 16, N. Y.
Send books checked. To expedite shipment I enclose
remittance \$.....
NAME
ADDRESS

LETTERS

The editors take no responsibility for the content of the letters published in this section. Anonymous letters will not be considered. Letters intended for publication should be typewritten double-spaced and submitted in duplicate. A letter writer should indicate clearly whether or not his letter is submitted for publication. For additional information, see Science 124, 249 (1956) and 125, 16 (4 Jan. 1957).

Passive Voice and Personal Pronouns

R. V. Ormes' judicious criticism of the passive voice [*Science* 125, 529 (1957)] reminded me, by contrast, of my own too sweeping indictment of it a year ago. A young chemistry major took my remarks seriously and wrote a formal account of experimental procedure entirely in the active voice, using the first personal pronoun. The result was revealing. At least it convinced me that the passive voice is sometimes preferable to the active, and that criticism of it should be confined, like Ormes', to its abuse.

To illustrate, here is a passage on procedure, chosen at random from the *Journal of the American Chemical Society*. The original reads: "The thick oil was dissolved in ether, the solution was extracted twice with dilute alkali, and the combined basic extracts were washed with ether. The ether solutions were combined, dried and evaporated to give 2.8 g. of starting alcohol. The basic solution was acidified with dilute sulfuric acid and extracted with ether. The ether layer was washed with water. . ."

Recast in the active voice, with the first personal pronoun, it reads: "We dissolved the thick oil in ether, extracted the solution twice with dilute alkali, and washed the combined basic extracts with ether. We combined the ether solutions, dried them, and evaporated them to give 2.8 g. of starting alcohol. We acidified the basic solution with dilute sulfuric acid and extracted it with ether. We washed the ether layer. . ."

Except for the opening sentence, the original version is superior, primarily because it places the emphasis where emphasis logically belongs: on the process rather than on the agent. Coherence is better too: in the original, the substance named at the end of one sentence tends naturally to become the subject or subject modifier at the beginning of the next ("... ether. The ether solution . . ."); in the revision, the reader is constantly brought back to "we" before he learns the next step in the on-going process.

But having stated the obverse or counterpart of Ormes' position with regard to the passive voice, I should like only to reinforce his position that the first personal pronoun is not an invariable sign of immodesty or subjectivity; sometimes considerations of objectivity

and responsibility, no less than of style, demand its use. Certainly avoidance of it is no guarantee of virtue; I recall one immodest self-reference that went something like this: "Analysis of this problem is difficult, but after long deliberation, it was decided by this analyst to. . ." Even worse is the pretense that beliefs are held and assumptions are made without danger of contamination from human fallibility. "It is assumed" may be quite all right for reminding a reader of assumptions customarily understood when certain equations are used, but the reader should know when the assumptions are original, and the simplest way to tell him is by saying "I have assumed. . ."

After all, human agents are responsible for designing experiments, and they are present in the laboratory; writing awkward phrases to avoid admitting their responsibility and their presence is an odd way of being objective. P. W. Bridgman (*Reflections of a Physicist*, 1950, pp. 57-58) puts it even more strongly: "In suppressing these personal expressions I am doing an unnatural thing that sometimes demands obvious circumlocutions and always involves an element of convention and construction. If I want to express what obviously occurs, I have got to use the first person. Has it ever been adequately proved, or has ever the assumption been adequately examined that in forcing myself to speak non-personally I have not thrown away something vital?"

JANE J. ROBINSON

University of California, Los Angeles

University Responsibilities and Government Money

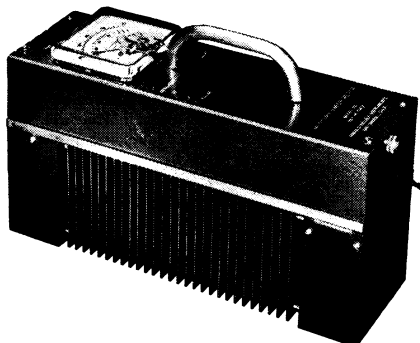
I agree very definitely with Paul Klopsteg [*Science* 124, 919 (1956)] that the danger of government sponsorship of research is that of violation of the integrity of the universities in their research programs. However, the proposals and the suggestions made by Klopsteg are, in my opinion, diametrically opposite to those which would solve the problem.

In principle, Klopsteg proposes that whenever funds are granted to an institution for a particular project by a government agency, these funds should cover only part of the costs, and the remainder of the costs should be supported from the university's research funds, thus fulfilling the obligation of the university to support research. That this method of operation would lead toward the domination of the over-all research activity of an institution by granting agencies can be made clear by the following example.

Let us assume that a given institution has a total of \$100,000 (including overhead) to distribute among its various research activities. In the absence of a granting agency, the institution can

mercury vapor detector

tells instantly when a hazard exists
in plant or lab atmospheres



Meter is calibrated in mercury concentrations for quick indication. The toxic limit is a full-scale reading on the high sensitivity scale of Model 23, illustrated. Wt.: 7 lbs.; size 13" x 8½" x 4½". Three models for varying ranges.

Write for bibliography on the mercury vapor hazard, and literature on Kruger Mercury Vapor Meters.

**HAROLD KRUGER
INSTRUMENTS**

BOX 164 • SAN GABRIEL, CALIF.

The American Association for the Advancement of Science announces three new symposium volumes of the utmost importance to psychiatrists, neurologists, clinical psychologists, physiologists, pharmacologists, and biochemists—and of great interest to the general public.

Tranquilizing Drugs

6" x 9", 205 pp., 32 illus., references, index, cloth, March 1957.

Price \$5.00. AAAS Members' cash order price \$4.50.

Psychopharmacology

6" x 9", 175 pp., bibliographies, index, cloth, 1956. Price \$3.50.

AAAS Members' cash order price \$3.00.

Alcoholism—

Basic Aspects and Treatment

6" x 9", 220 pp., 33 illus., references, index, cloth, May 1957.

Price \$5.75. AAAS Members' cash order price \$5.00.

AAAS Publications

1515 Mass. Ave., NW, Washington 5, D.C.

choose, using its best judgment for the benefit of mankind, which individuals and research programs it will support with this fund. We must further assume, which is generally true, that the institution would like to enlarge its research activities. This desire is certainly in line with the aims of Congress as specified in the formation of the National Science Foundation. To simplify our thinking, let us assume that the granting agency agrees to spend \$5000 for 20 specific projects which it approves, provided that a corresponding and equal amount of money toward each of these projects is granted by the institution. Thus, the institution can double its research activity and spend \$200,000 on research, provided that it undertakes projects approvable by the agency. On accepting the aid of the granting agency under this procedure, the institution becomes the servant of the granting organization, which effectively controls the whole research program at the university. Under the alternative system, the granting agency would support the total costs of ten specific projects at \$10,000 each which are approved by the granting agency. At the same time, the institution will retain its integrity with respect to the expenditure of the \$100,000 which it originally had, and it may now devote this money to any ten research projects which it feels, or its scholars feel, are best, regardless of the views of the granting agency. Thus the institution is no longer the complete slave of the granting agency.

Another insidious method of using the institution's funds in the support of research approvable by a granting agency is that of requiring that the principal investigator, who devotes a material part of his effort to the work supported by the grant, shall do so without charging his time to the grant, thus forcing the institution to carry his salary and its share of the overhead. In many cases, especially in the case of small grants, this cost is as large as, or larger than, the grant itself.

A further loss of control by the institution of the direction in which its own funds may be used through the procedure suggested by Klopsteg is brought about in a more subtle manner. Whenever a sponsoring agency fails to provide the full indirect costs of a project by limiting the allowance for them to 15 percent of direct costs or to some other arbitrary figure that is less than the true cost, the institution is forced to use a portion of its free funds to make up the difference. This must of necessity be true, since overhead rates are determined by distributing actual indirect costs over all programs, whether or not the overhead costs are provided by the granting agency. Since this indirect contribution to an added project through the failure to ob-

*To Find the FUNNEL
You want—come to ACE*

Ace has a most extensive range of Funnels, listed on seven pages in Catalog "50," including the complete line of Kimble brand separatory funnels.

Whatever you need in laboratory glassware and related products, check Ace craftsmanship, budget prices and courteous service . . . Know why Ace is your best buy. Ask Dept. FN- E to send you Ace Catalog "50"

Also in stock at our Midwestern Division, 639-41 South Hancock Street, Louisville, Kentucky.

ACE GLASS INCORPORATED
VINELAND ♠ NEW JERSEY
639-41 SOUTH HANCOCK ST.
LOUISVILLE, KY.
Glassware Specialists to Industry and Research

tain full overhead may be obscure, institutions are prone to accept the grant without qualm. However, when the number of projects reaches a significant size over several years, the total value of general funds used in this manner becomes an important drain on general funds that might otherwise be used for university-sponsored research, faculty salaries, or other activities traditionally associated with the institution. Klopsteg's implication that overhead funds are "uncommitted money" would appear to indicate his failure to understand the concept of indirect costs. Expenses for which overhead allowances are made must be paid by the institution. If the overhead allowances themselves are identified as "uncommitted money," then other available "uncommitted money" must be used to pay for the overhead expenses. There can be no net gain in "uncommitted money" from overhead allowances in the long run, for administrative costs must be paid, research buildings and equipment must be maintained and replaced, and the library facilities must be available for research workers. It is these costs that an overhead allowance is designed to cover. It does not increase the volume of free funds in an institution.

CARL C. CHAMBERS
University of Pennsylvania, Philadelphia

My purpose in publishing the article to which Carl Chambers refers, and the one in the next following issue of *Science*, has been accomplished when thoughtful, judicious persons like Chambers are moved to comment on the problems discussed. Whether our views coincide or differ matters little. What is important is recognition of the problems, and action to solve them.

It is quite impossible within the scope of a letter and a response to reconcile all the divergent views, nor does it seem possible at all, for we are dealing with opinions based on appraisal and judgment of facts and assumptions. What I shall attempt to do is to clarify where it appears that Chambers misunderstood what I tried to convey.

One such instance appears in his second paragraph in which he makes a condensed and, I regret, an erroneous paraphrase of what I "propose in principle." I do not propose that "whenever funds are granted to an institution . . . by a government agency, these funds should cover only part of the costs." On the contrary, in those research areas in which by far the greatest volume of government money flows to the institutions, I have stated that all costs, direct and indirect, should be *adequately* covered. These areas are comparatively new in the research pattern at universities, having come into being under OSRD during World War II. Most of the work is applied, not basic.

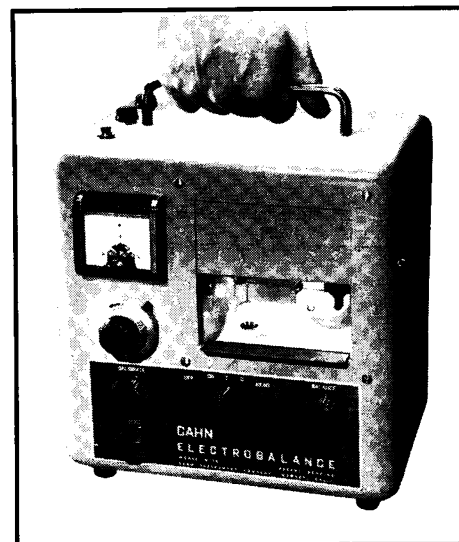
7 JUNE 1957

A NEW Analytical Tool!

The CAHN ELECTROBALANCE

from Will

Measures Mass
DIRECTLY
MORE PRECISELY
...and FASTER
than conventional
Dilution Methods



The Cahn Electrobalance is an entirely new concept in micro weighing. It's as portable as a typewriter and as easy to set up and operate.

It is unaffected by vibration, variable temperature, air currents or even by leveling.

Sample is weighed by balancing against an electromagnetic torque which is electrically controlled with high precision. Weighing chamber may be removed and operated by remote control.

SWITCH SELECTS ANY ONE OF THESE FOUR RANGES:

Range	Sensitivity	Accuracy
0-5 mg.	1 microgram	2.5 micrograms
0-10 mg.	2 micrograms	5.0 micrograms
0-20 mg.	5 micrograms	12.0 micrograms
0-50 mg.	8 micrograms	30.0 micrograms
Precision 0.02%		Accuracy: About 0.05% of full scale.

Will No. 3276T Cahn Electrobalance complete with stirrups, supply of disposable aluminum pans, and set of 4 Class M calibrating weights **\$615.00**

Will CORPORATION
and subsidiaries

Specialists in  Scientific Supply
ROCHESTER 3, N. Y. • ATLANTA 1, GA. • NEW YORK 12, N. Y. • BALTIMORE 24, MD. • BUFFALO 5, N. Y.

SO. CHARLESTON 3, W. VIRGINIA

The much smaller segment of research, aided by government, in which I strongly feel that institutions must maintain complete independence and integrity, is that which by tradition is the admitted responsibility of the university. To preserve the essential freedom, it is necessary that institutions receive financial aid from many sources, so that they may support competent scholars on their faculties in their intellectual pursuits, with complete absence of extraneous intervention, domination, or control. Money from private individuals and foundations assures such freedom. Money from government does not, since this is public money over which surveillance must be exercised in the public interest. If an institution, viewing a source of government funds as a virtually inexhaustible reservoir, insists that a grant or gift from such a source to help it in supporting scholarly research must cover fully every kind of outlay, direct and indirect, such insistence increases the danger of government control. This follows, because such discussions about overhead bring into the argument fiscal questions by participants who lack understanding of the ideals and functions of the university.

In dealing with private sources of gifts, the point is seldom made by universities that such sources must accompany their grants by an additional 25 to 50 percent of the principal amount tendered to cover indirect costs. Generally, private gifts are happily accepted as tendered, and great good will continues between the institution and the donor. If private sources could be stimulated to provide sufficient funds to enable universities and colleges to carry on their important functions, as is discussed in my second article, the question of overhead on gifts would fade away. To my knowledge, it never arose before government money came into the picture.

For a number of years, I have been in position to observe "from the inside" the increasing support of research through government funds. There is nothing insidious or sinister in the management of these funds by any agency. Those responsible for allocation and disbursement are honest, devoted public servants. Their duty to the taxpayer requires that they exercise judicious "control"; that is, they are responsible for seeing that funds under their supervision are handled properly under applicable statutes and the rules and regulations that have been derived from them. Because I feel so keenly the need for preserving freedom of action for the institutions, both intellectually and administratively, I feel growing apprehension over the fact that, as financial support from a given source increases, so also does the amount of control from that source increase.

If what I have written here and in my articles on these questions conveyed the

impression that I fail to understand the concept of indirect costs, it is only because I failed to express myself clearly. During my many years as a business executive, I have had long, practical experience with that subject. Indeed, the problem of overhead is a perennial subject of discussion, if not controversy, among cost accountants. In its practical applications, it must in some of its aspects be handled arbitrarily. Probably it can never be settled to the satisfaction of everyone concerned with it. The use of the term *true cost* by Chambers implies a concept that is practically attainable. A method of determining the true cost

of the contemplated basic research of a faculty scholar would be a major contribution to the art of accounting.

I respect Chambers and his views highly. I hope that it is not impertinent for me to say that the views are not unfamiliar to me, for I have heard them expressed in many discussions with university administrators. If he and I could discuss them in person, which I hope we may do, I am sure that we could substantially reduce our differences concerning the important questions under scrutiny here.

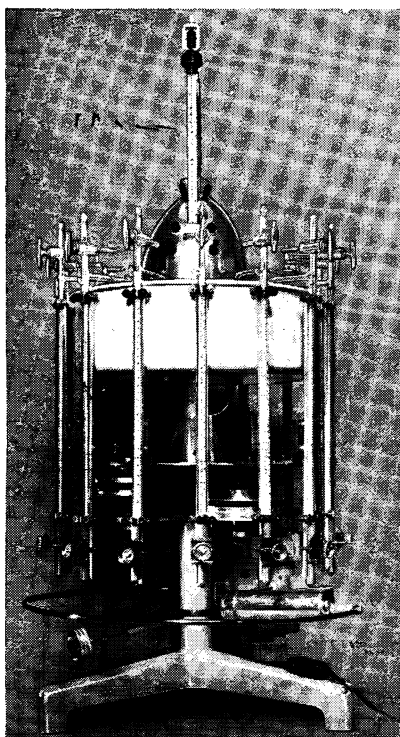
PAUL E. KLOPSTEG

Glenview, Illinois

THE "BRONWILL"* Warburg

most compact-most versatile

Warburg Available



Model UV shown above, is a compact, circular unit, only 20½" diameter, 31" high, rotatable thru 320° permitting any of the manometers to be quickly read. Model UVL equipped for photo-chemical work.

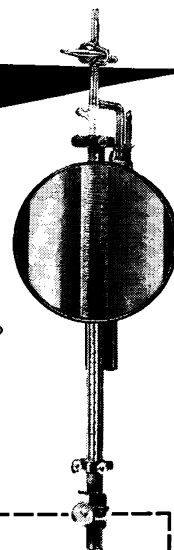
Requires only 20½" of Desk Space

- Magnetic Temperature Setting.
- Highest Temperature Constancy $\pm 0.01^\circ \text{C}$.
- Cooling Coil Built In.
- Fastest to Set Up. Small bath (only 8 liters) heats from ambient to 37°C in 22 minutes.
- Rotatable thru 320° .
- Calibrated—Interchangeable Manometers & Vessels Available.
- Available for Photosynthesis.

EASY TO READ

DOUBLE CAPILLARY MANOMETERS

Single background scale—a sturdy single rod containing two capillaries. Available pre-calibrated—interchangeable—no more calibrating each time a piece is broken.



*The trademark identifying products of Bronwill Scientific Division, Will Corporation.

BRONWILL
SCIENTIFIC DIVISION
WILL CORPORATION

131 GOULD STREET
ROCHESTER, N. Y.

BRONWILL SCIENTIFIC DIVISION
WILL CORPORATION

131 Gould St., Rochester, N.Y., Dept. S-67

Please send full information on Bronwill Warburgs.

Name.....

Position.....

Company.....

Address.....

City.....Zone.....State.....