

Scientific safety deposit box

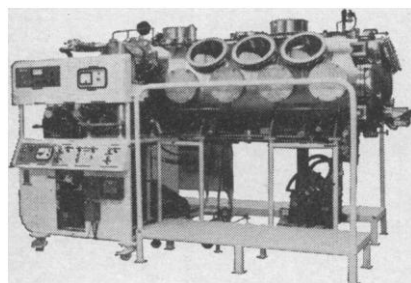
When you place an experiment in a Blickman Vacuum and Controlled Atmosphere Complex, you can be positive of proper vacuum or inert atmosphere readings. That goes for R&D in biological sciences, nuclear projects, metallurgy or any other research that deals with exotic or dangerous materials.

High integrity Blickman Vacuum and Controlled Atmosphere systems help speed the work, maintain valid results and protect against hazards.

Brookhaven National Laboratories uses the illustrated unit for inert atmosphere welding. In it, scientists do experimental welding of rare metals or investigate reactor fuel elements.

The question is what do you want to accomplish? With years of design work and hundreds of these systems behind us, Blickman has a huge engineering library. You concentrate on designing the system, not the "nuts and bolts."

Your system? The coupon brings you details.



S. BLICKMAN, INC.
6903 Gregory Ave., Weehawken, N. J.

- ☐ Please send book on safety enclosures
☐ Also send catalog on laboratory furniture

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

SEE US AT BOOTH 720-722,
FASEB, ATLANTIC CITY, APRIL 15-19

sample and results were extrapolated. Our article stated that 12 robins was an average of many counts within these study areas, not a single count of 12 robins as Jukes inferred. The potential inaccuracies of extrapolation are quite evident to any scientist, which was why we used the process only as a "rough estimation." Major conclusions were not based on the accuracy of this extrapolation in any event.

Jukes has erected, then demolished, the abominable straw man of robin extinction. We never mentioned this point however, nor have other scientists. While treatment of elms has killed millions of robins, high reproduction rates, increased habitat (suburbia) and decreased predation all contribute to rising robin populations. DDT does contribute to substantial population declines among many other avian species, however (3). Jukes's is an example of the kind of thinking that concludes all is well with pesticides as long as there is food on our tables and robins on the lawn.

CHARLES F. WURSTER, JR.

Department of Biological Sciences,
State University of New York,
Stony Brook 11790

References

1. E. McPherson, *Grass Valley Union* (California), 14 Feb. 1968.
2. D. H. Wurster, C. F. Wurster, W. N. Strickland, *Ecology* 46, 488 (1965).
3. C. F. Wurster and D. B. Wingate, *Science* 159, 979 (1968).

Federal Animal Care Projects

Cohen's report on the evaluation of animal care programs by the American Association for Accreditation of Laboratory Animal Care (Letters, 29 Dec.) should be encouraging to all who believe that peer evaluation within the scientific community can be successful. With the introduction of the Javits-Rogers bills (S. 2481, H.R. 13168), this concept and all issues regarding research-animal care will be increasingly debated.

The debate will probably cause some to inquire about current federal efforts to improve care and treatment of research animals. The Department of Agriculture's role through enforcement of PL 89-544 has certainly been significant in "persuading" some institutions to improve their animal care programs. Other federal agencies contribute through exemplary "in house" ani-

mal programs and research on animal care problems.

The National Institutes of Health has a program to assist institutions in meeting their requirements for research-animal resources. This project grant program may support a variety of activities for improvement of animal resources and animal care programs. The projects range from highly specialized unique colonies of research animals to programs for improving the facilities, the scientific medical management of institutional animal colonies, and training programs for specialists in laboratory animal medicine. The program further supports projects for elucidating new model animal systems for more efficient and effective research into human health problems.

As more and more scientific institutions and their investigators recognize the significant contributions that can be made by the use of the correct animal model, properly cared for, we can expect even greater benefits than heretofore realized from animal research.

LOWELL E. WHITE, JR.

School of Medicine,
University of Washington, Seattle

Interstellar Travel

Although I endorse "Clarke's Third Law" (Letters, 19 Jan.), I challenge his statement that "any really competent extrapolation shows interstellar travel to be a rather simple engineering accomplishment."

An eminent practitioner of space vehicle design, Maxwell W. Hunter II, concurs with Clarke that fusion propulsion holds great promise for interstellar space ships capable of traveling at fractional speed-of-light velocities (1). However, he underscores the incomprehensible energy requirements necessary to propel spacecraft of realistic sizes. These demands would be measured in proportions of the total power output generated by the sun. Accordingly, the radiation-shield requirements, which compound the hazard of inadvertently vaporizing the manned spacecraft itself, appear to pose formidable problems based on any materials or cooling techniques known today. Further, each pound of spacecraft mass would necessitate initial space vehicle weights, which can be measured only in terms of significant fractions of the earth's total weight. Associated with

these masses are the enormous thrust levels required for mandatory accelerations (a minimum of 1g from the orbit of the earth), for acquiring partial-light velocities in order to maintain practical acceleration-deceleration and realistic transit-time spans; that is, within a human lifetime. Moreover, techniques for magnetic containment of stabilized self-sustaining fusion reactions constitute a monumental engineering challenge.

Additionally, travel at even quasi-relativistic velocities would produce contingent cosmic ray fluxes, as the starship impacts the widely dispersed atomic particles of interstellar space. As a further sociological obstacle, the implications of time dilation phenomenon may not prove fully acceptable to either the flight crew, or to their earth-bound families.

Conversely, the promising specific impulse magnitudes (in hundreds of thousands of seconds) and the impressive characteristic velocity capabilities (in millions of feet per second), make fusion propulsion and mass-annihilation rockets the most attractive candidates for the distant future. However, the estimates of \$11,000 per kilo of helium-3, coupled with the \$275 per kilo of deuterium (heavy hydrogen) fuel, are totally inconsistent with the current budgets for lunar and planetary exploration. For purposes of comparison, today's liquid oxygen-kerosene rocket propellants cost 4.4¢ per kilo. Such fusion propellant costs appear to suggest that this human technological accomplishment is, indeed, two or three hundred years post-Apollo! Nevertheless, it is encouraging to discover that the national space agency is sufficiently far-sighted to sponsor "token" analytical efforts on fusion rockets. In an engineering paper titled "Fusion propulsion for interstellar missions" presented in November 1965 at a New York Academy of Sciences conference, Dwain F. Spencer reported on research conducted by JPL-California Institute of Technology under NASA contract No. NAS 7-100. How long must man's long-range space objectives be postponed until this type of vital exploratory research is again seriously sponsored by any federal agency?

PHIL BONO

Space Systems Center, Douglas Aircraft Company, 5301 Bolsa Avenue, Huntington Beach, California

Reference

1. M. W. Hunter II, *Thrust Into Space* (Holt, Rinehart & Winston, New York, 1966).

29 MARCH 1968

Control your temper with a Lauda Circulator

Need to temper glassware or other laboratory equipment?

Let a Lauda Circulator do it.

A variety of different models (K-2 shown here) circulate water, oil or other liquids at constant, electronically-controlled temperatures up to 300° C., or as low as -120° C. Each features stainless-steel construction of all components in contact with bath liquid, manual drainage and flow valves, and automatic excess load protection for pump.

Our new 36-page catalog gives you all the details. Just write: Lauda Circulators, Division of Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590



Lauda Circulators



Published September 1967

FORMULATION OF RESEARCH POLICIES

Collected Papers from an International Symposium

Edited by LAWRENCE W. BASS and BRUCE S. OLD

AAAS Publication No. 87, 218 pages, tables, illustrations.

Regular Price \$7.75. AAAS Members' Cash Orders \$6.75.

Formulation of Research Policies is a collection of papers presented at a Gordon Research Conference held in Santa Barbara, California, in 1966. Nineteen leaders in the field of policy formulation from eleven foreign countries and the United States analyze and describe science policies at national, international, and corporate levels.

Today, nations great and small as well as corporations find it impossible to support all of the science and technology that appears to be relevant to their growth and strength. Hence, science policy or the "science of science" at all levels compels serious attention and discussion. And the magnitude of many research projects tends to foster international cooperation in administration and funding.

Goals and accomplishments—and weaknesses—of past and present science policies of nations, government agencies, individual industries, and international organizations are given expert and candid appraisal in this work—the record of an exciting conference.

AAAS

1515 Massachusetts Ave., NW
Washington, D.C. 20005

Borden's reagents are the finest made. Here's one:



(We have 299 more.)

Among the 300 reagents of Borden Chemical's Dajac Laboratories, you will find not only Nitro BT®, but also INT, Blue Tetrazolium (BT®) and TNBT. All of these Dajac reagents are the recognized leaders for purity and reliable results in their field.

Free Catalog: For complete information on these compounds and our enzyme substrates, fluorescent dyes, and analytical reagents, write for a copy of our current catalog.



Dajac Laboratories

The Borden Chemical Company
5000 Langdon St., Box 9522
Philadelphia, Pa. 19124

