not, and can be transferred from one weapon to another as military styles change. Just how generous the resulting stockpile actually is can be calculated in numerous ways: one way is that adopted by President Johnson, who, without going into the intricacies of the overkill argument, announced on 21 January that "this country and the Soviet Union already have produced enough explosive force to equal 10 tons of TNT for every man, woman and child on the face of this earth." The stockpile, in any event, is big enough so that the President has ordered a substantial slowdown, convinced that U.S. security will not be even marginally affected.

How did we arrive at this state of nuclear superfluity? The secrecy which has surrounded the stockpile—in sharp contrast to the bravado with which the number of missiles, submarines, and other military hardware is regularly announced—has certainly played a role. Although one reason for the adoption of a policy of secrecy was the fact that, for a long period after World War II, America's atomic power was a good deal less than an awed world imagined it to be, the result of the secrecy was to insulate the entire weapons program from public scrutiny. Secrecy also strengthened the hand of members of the Joint Committee on Atomic Energy in developing influence over their uninitiated congressional colleagues, since it was impossible for outsiders to argue with the Joint Committee's definitions of necessity.

Role of Congress

The development of the bomb had been kept secret even from most members of Congress, and Joint Committee members were the first to get a semblance of atomic education. The superior knowledge acquired by the embryo committee during the postwar fight over military versus civilian control of atomic energy gave the committee a particularly authoritative and exclusive character which it has been careful to retain. Because its jurisdiction follows the atom, the committee has always pushed for atomic expansion. Lately, as possible uses for atomic power have increased, the Joint Committee has encouraged the application of nuclear power to a number of fields. In the early days, however, influenced by the war in Korea, by deep suspicion of the Communists, and by the conviction that nuclear power would both revolutionize warfare and make it more economical, the JCAE focused its attention on more warlike matters. Typical of the congressional exuberance which encouraged the first great expansion of nuclear capacity was a resolution introduced by former Representative Carl Durham (D–N.C.), an early chairman of the Joint Committee, in September 1951. After a lot of "whereases" enthusiastically detailing the flexibility and economy of nuclear power, the resolution concludes "that it is the sense of Congress that an allocation of 3 cents in each military dollar for our best and cheapest weapon is unreasonably and imprudently small; that the Army, Navy, and Air Force must each be rapidly equipped with atomic weapons in far greater number and variety, looking toward more security for the United States at lower annual defense budgets; and therefore be it further resolved, that the United States must go all out in atomic development and production."

Supplementing congressional enthusiasm for the new weapon as a cause of nuclear expansion was the military's habit of accepting anything that was proffered; underlying it was the intensity of the cold war, which encouraged the view that accumulation of destructiveness had in itself a deterrent effect. For, unbelievable as it seems, until last winter, when the Department of Defense completed its first long-range study of projected needs for nuclear materials—a study that established the feasibility of the current cuts—procurement was determined simply by the ability of the AEC to produce. Annually, the Pentagon would ask the AEC how much fissionable material it could produce, and it would formally request receipt of whatever amount the AEC was capable of supplying. Since the funds for the warheads came out of the AEC's budget, not out of the Pentagon's, fissionable material was not in competition with any other Pentagon requirement. Stated simply, there were no constraints whatever, and the stockpile went skyrocketing. Occasionally the Joint Committee suggested that someone take a look at this non-system, but until Kennedy took office and initiated the study which led to the cutback, neither the extravagance nor the provocativeness of the stockpiling attracted any serious attention. And, however compelling the arguments in favor of a cutback, it is a safe guess that without the blossoming Soviet-American détente the cutbacks would not have been made, for until very recently, the fear was strong on both sides that any letup in the pace of acquisition would be interpreted by the other as irresolution.

Even with the cutbacks, of course, the stockpile will continue to grow. Shutdowns always mean hardships—and political tribulation: that is another reason why these have come so belatedly. It appears from the way the cutbacks are distributed that the human consequences were kept firmly in mind, for more money could probably have been saved by shutting down some plants entirely. Even with the cutbacks, the United States will hardly be running on a nuclear shoestring. On the contrary, the main object appears to be only to replace the practice of irrational hoarding with a more calculated system of accumulation. Dipping into the nuclear capital itself, or relying solely on it, appears still to be unthinkable.—ELINOR LANGER

Announcements

Jefferson Medical College and Drexel Institute of Technology, Philadelphia, Pa., have announced a cooperative program leading to the Ph.D. degree in **biomedical engineering**. The program, scheduled to begin with the fall semester, is designed for persons who intend to specialize in teaching and research. Participants may enroll in either college and will take courses in the life sciences at Jefferson, in physical and engineering sciences at Drexel. Additional information is available from LeRoy Brothers, Dean of the College of Engineering at Drexel, or William Sodeman, vice president for medical affairs at Jefferson.

The Office of Naval Research and The Institute of Management Sciences invites manuscripts on "**capital budgeting of interrelated projects.**" The author may be a student, or have received his last academic degree within the past 7 years. Papers must provide reports of research that "yields either increased knowledge or improved ability to deal with important classes of problems" in the area, and preference will be given manuscripts in which the research stresses mathematics, statis-

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tics, or computer simulation. The papers judged best will be included in the third volume of the ONR monograph series, *Mathematical Methods in Logistics*; the author of the best paper will be offered an opportunity to spend a year on full-time research in logistics or related fields, at an $11,000 salary. Deadline for receipt of manuscripts: *30 June*. (Logistics and Mathematical Statistics Branch, ONR, Washington 25, D.C.)

Grants, Fellowships, and Awards

The Helen Hay Whitney Foundation offers research fellowships to persons who are considering a career in **biological or medical research**, preferably relating to diseases of connective tissue. Applicant must hold the M.D., Ph.D. or equivalent degree, and be no more than 35 years of age. The fellowships carry a $6500 stipend, and $500 per dependent; they are renewable for 3 years and have a $500 annual increment. Deadline for receipt of applications: *15 August*. (Helen Hay Whitney Foundation, 22 E. 65 St., New York, N.Y. 10021)

The Australian Academy of Science is offering the Selby fellowship for postdoctoral research in the **physical or biological sciences**. The fellowship carries a stipend of £A2000 (equivalent to approximately $4465 in U.S. funds) for a year's work at an Australian university or research institution of the recipient's choice. Applicants must submit a statement of the general scope and nature of their proposed research, their choice of university or research institution, copies of published papers, and the names of three references. Deadline for applications: *30 July*. (Assistant Secretary, Australian Academy of Science, Gordon St., Canberra City, A.C.T., Australia)

The Damon Runyon memorial fund for **cancer research** is offering research fellowships, to begin 1 January. Applicants must have received their doctorate, or have completed all requirements for it; persons who have already had 3 years of postdoctoral fellowships are not eligible. The recipients may study at the institutions of their choice, and may be permitted limited teaching or clinical work if it

is consistent with their training during the term of the fellowship. The stipends are $5000, plus $500 each for a maximum of three dependents. The fellowships are for 1 year, renewable for an additional year. Deadline for receipt of applications: *1 July*. (J. H. Teeter, Damon Runyon Memorial Fund for Cancer Research, Inc., 730 Fifth Ave., New York 19)

Grants are available for participants in a mathematics institute in **analysis**, scheduled 15 June to 7 August at Lehigh University. Applicants must have completed at least a year's graduate work in analysis, and be planning to write a Ph.D. thesis on the subject. Stipends for U.S. students are $600, plus $120 per dependent, and travel allowances. Foreign applications also will be considered, but recipients will receive only the stipend. The institute is supported by a $49,500 NFS grant. (A. E. Pitcher, Department of Mathematics, Lehigh University, Bethlehem, Pa.)

Predoctoral fellowships are available from the University of Miami for an interdisciplinary program leading to a Ph.D. in biochemistry, zoology, or physiology with a major in **cellular and molecular biology**. Stipends are $2200 to $2600. (E. L. Chambers, Graduate Program in Cellular and Molecular Biology, University of Miami, Coral Gables, Fla. 33134)

The Life Insurance Medical Research Fund is accepting applications for grants to institutions for research on **cardiovascular problems**. The awards, to support basic research, will be available in July 1965. Deadline for receipt of applications: *15 September*. (W. A. Jeffers, Scientific Director, Life Insurance Medical Research Fund, 1030 East Lancaster Ave., Rosemont, Pa.)

Meeting Notes

The Instrument Society of America will sponsor a research conference on **instrumentation**, 3–7 August, in Geneva, N.Y. Among the topics to be included are geodetic instrumentation in the space sciences, systems for manipulation of physical data, problems and solutions in process instrumentation, applications of lasers and coherent light, elements and principles for instrumentation design, and current problems in instrumentation science. Morn-

ing and evening sessions only are planned, leaving the afternoons free for informal discussions. Attendance, by application only, will be limited to about 100 participants. (H. S. Kindler, 530 William Penn Place, Pittsburgh, Pa.)

The fourth inter-American conference on **toxicology and occupational medicine** will be held in Miami Beach, Florida, 24–27 August, sponsored by the medical schools of the University of Miami and the University of Puerto Rico. The meeting will focus on recent developments in toxicology, radiology, and occupational and space medicine; approximately 250 scientists plan to attend, representing North and South America and several European nations. (W. Machle, University of Miami School of Medicine, Coral Gables, Florida)

Oak Ridge National Laboratory will sponsor its eighth conference on **analytical chemistry in nuclear technology,** 6–8 October, in Gatlinburg, Tenn. The meeting will center on "determination of interstitials and trace constituents in reactor materials and products"; sessions will be held on various methods of analysis; determination of carbon, hydrogen, oxygen, and nitrogen in metals; and determination of trace constituents. Papers are invited for the meeting; they should be primarily discussions of novel methods of analysis and of instrumental devices. Abstracts of 500 words are required, and the presentation time for papers should be no more than 25 minutes. Deadline for receipt of abstracts: *10 July*. (C. D. Susano, ORNL, P.O. Box X, Oak Ridge, Tenn.)

The ninth international conference on **low temperature physics** will he held 31 August to 4 September, in Columbus, Ohio. The meeting, sponsored by the International Union of Pure and Applied Physics, will include papers on superconductivity; liquid and solid helium-3 and helium-4 and their mixtures; and properties of gases, liquids, and solids at low temperatures. About 800 delegates are expected to attend. (The Conference, P.O. Box 3073, University Station, Columbus, Ohio 43210)

The American Society for Microbiology invites papers for presentation at the fourth interscience conference on **antimicrobial agents and chemotherapy,** 26–28 October in New York. Topics to

be covered include the discovery, production, and use of new compounds; taxonomy of producing organisms; identification and isolation procedures; structural chemistry and synthesis; in vitro studies; experimental chemotherapy; pharmacology; and clinical studies, including development of resistance and allergy. Papers must contain data not previously published or presented at national meetings. Deadline for submission of titles and abstract: *15 July*. (American Society for Microbiology, 115 Huron View Blvd., Ann Arbor, Mich.)

The University of Denver Research Institute will present its 11th annual symposium on **computers and data processing**, 24–25 June, in Estes Park, Colorado. Twelve papers will be presented on the various aspects of research and development. (W. H. Eichelberger, Denver Research Institute, University of Denver, Denver, Colo., 80210)

A symposium on **thalamic regulation of sensorimotor activities** will be held at Columbia University, New York, 30 November to 2 December. The conference is to be the first of a series scheduled by the Parkinson's Disease Research and Information Center; it is cosponsored by the National Institutes of Health and the Parkinson's Disease Foundation. (M. D. Yahr, New York Neurological Institute, 710 W. 168 St., New York 32)

Denver Research Institute plans to present its 13th annual conference on the applications of **x-ray analysis**, 12–13 August, in Denver, Colorado. Sessions will be held on emission spectrography, microprobe, absorption and microscopy, and instrumentation. Approximately 250 representatives from industry, universities, and manufacturers of x-ray equipment will attend. (M. D. Robbins, Denver Research Inst., University of Denver, Colorado)

The call for papers has been issued for the 11th **nuclear science** symposium, 28–30 October, in Philadelphia, Pa. It is sponsored by the professional technical group on nuclear science of the Institute of Electrical and Electronics Engineers; co-sponsors are the AEC and NASA. The meeting will center on nuclear instrumentation in space and in the laboratory; topics include laboratory instrumentation, nanosecond circuitry, radiation detectors, space nuclear propulsion, space instru-

mentation and space phenomena, reactor control instrumentation, and radiation effects. Abstracts of 100 to 300 words are required. Deadline: *1 July*. (W. A. Higinbotham, Brookhaven National Laboratory, Upton, L.I., New York 11973)

Lehigh University's chemistry department has scheduled its third annual symposium on **instrumental analytical chemistry**, 13–18 July. Emphasis will be on recent applications and modifications of instruments readily available to analytical chemists. The topics to be discussed include atomic adsorption spectrometry, color evaluation, isotope dilution analysis, near infrared and infrared spectrophotometry, neutron activation, and x-ray diffraction and fluorescence. The meeting is open to persons with a bachelor's degree in chemistry or an allied field, or equivalent industrial experience. (A. J. Diefenderfer, Department of Chemistry, Lehigh University, Bethlehem, Pa.)

Fisk University will present its 15th annual **infrared spectroscopy** and **gas chromatography** institute 11–21 August. The first infrared session, 11–15 August, will review elementary theory and present laboratory work on modern commerical infrared spectrophotometers. Participation is limited to 60 persons, and tuition is $125.

The gas chromatography session, also 11–15 August, will present theory, applications, and techniques; laboratory work will be in the use of gas chromatographic instruments, preparation of samples, packing of columns, and reading and interpretation of gas chromatograms. Tuition is $125; 60 persons may attend.

The second infrared session, 17–21 August, will feature interpretation of recent developments in infrared techniques. Participation is limited to 80 persons; tuition is $150.

In addition to the tuition, a $10 registration fee is required; on-campus housing and meals are available for $50 for each session. (N. Fuson, Fisk Infrared Institute, Fisk University, Nashville, Tenn.)

Courses

A workshop on the use of **gas chromatography** in clinical chemistry will be held 20–24 July at the Baylor University college of medicine, sponsored by the Texas section of the

American Association of Clinical Chemists. It will include both lecture and laboratory sessions. (F. B. Moreland, Department of Biochemistry, Baylor University College of Medicine, Houston 25, Tex.)

Massachusetts Institute of Technology plans a course in **thermodynamics** 29 June to 3 July, for engineers and scientists interested in teaching, research, and development. The course will stress gravity, electrostatic and electromagnetic force fields, equilibrium in nuclear processes, fluctuations, information theory, quantum mechanics, relativity, and thermodynamics of irreversible processes. (Summer Session Office, M.I.T., Cambridge, Mass. 02139)

The Mellon Institute, Pittsburgh, Pa., will present a course on the mechanics of **non-Newtonian fluids**, 8–13 June. It is designed for persons interested in both experimental and theoretical aspects of the topic. (C. B. Willingham, Mellon Institute, Pittsburgh, Pa.)

An institute in "probabilistic techniques in **systems reliability** and maintainability" is scheduled 13–24 July at New York University. Participants must have a knowledge of probability and stochastic processes. (R. N. Wilburn, Bureau of Conferences and Institutes, New York University, 6 Washington Square N., New York 10003)

A course on the combined use of **analog and digital computer techniques** is scheduled 8–19 June at the University of Southern California. Engineering applications of hybrid techniques will be stressed in lecture and laboratory sessions, and material on mechanization of combined systems also will be presented. (G. A. Bekey, Electrical Engineering Department, U.S.C., Los Angeles, Calif. 90007)

A course in **electron microscopy of biological materials** will be given at the University of California, Berkeley, 6–24 July. It is designed for academic, professional, and industrial personnel. Participants will conduct research of their own choosing, with assistance from the faculty and from the staff of the school's Electron Microscope Laboratory. Applicants must have at least a bachelor's degree in biological sciences, and have had some research experience in the field; applications

should include a brief outline of the proposed project. The enrollment fee is $400. (Engineering Sciences Extension, University of California, Berkeley 94720)

New Journals

Alabama Journal of Medical Sciences, vol. 1, No. 1, January 1964. Emmett B. Carmichael, editor. (University of Alabama Medical Center, 1919 Seventh Ave. South, Birmingham. Quarterly, $6 per year)

Birth Defects. Abstracts of selected articles, vol. 1, No. 1, January 1964. (The National Foundation, Supply Division, Rm. 555, 800 Second Ave., New York 10017. Monthly, $5 per year)

Surface Science, vol. 1, No. 1, January 1964, Harry C. Gatos, editor. (North-Holland Publishing Co., P.O. Box 103, Amsterdam, Netherlands. Quarterly, $16 per year)

Films

The following films are available from the Bureau of Audio-Visual Instruction, State University of Iowa, Iowa City. Rental: $10 each; purchase: $275 each, or $750 for all three.

Atomic Models, Valence, and the Periodic Table (U-5113). Shows convalent radius, valence electronic structure, and electronegativity; new periodic chart and its applications in teaching.

New Models of Molecules, Ions, and Crystals: Their Construction and General Use in Teaching Chemistry (U-5114). Construction of molecular or crystal models of about 60 elements and compounds; their use in conjunction with atomic models in explaining the physical nature of the elements and the composition and properties of compounds.

A Special Set of Models for Introducing Chemistry (U-5115). Describes a set of 25 specially selected chemical models and their uses in teaching many fundamental principles of elementary chemistry.

Publications

The Department of Commerce has made available a bibliography of **Soviet research in field emission** from 1960 to 1963. It includes approximately 80 references on both experimental and theoretical aspects of field electron and

ion emission from metals and semiconductors. Most of the papers listed are in Russian, and, where available, full references are given to English translations of the entries. (*Soviet Research in Field Emission, 1960–1963; An Annotated Bibliography.* National Bureau of Standards Technical Note 234; Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402. 39 pages. 30 cents)

The **National Institutes of Health** has published the 1964 edition of its Directory-Bibliography. The book presents broad outlines of NIH structure, names the professional staff, and lists the scientific and technical publications of staff members during 1963. It is intended as a reference for research workers in the biomedical sciences. Single copies are available at no charge. (Office of Research Information, Bldg. 31, Room 4B-11, NIH, Bethesda, Md. 20014)

M.I.T. Libraries announce the publication of the **Correlation Index to Current Department of Defense Research Reports**, prepared in cooperation with the libraries at U.C.L.A. and the University of Washington. The volume contains a listing, by Defense Document Center accession number, of microfilm reports on deposit in the Regional Technical Report Centers of the Office of Technical Service. It also includes a correlation index by issuing agency report number, which indexes *U.S. Government Research Reports*, and the unclassified section of *Technical Abstracts Bulletin*, June 1962 to June 1963. Semimonthly supplements are planned. (R. L. Snyder, Associate Director of Libraries, Rm. 14-E210, MIT, Cambridge 39, Mass. $10 per copy)

Biological Abstracts is offering a new "microfilm program," through which life scientists may obtain microcard copies of abstracts in the areas covered by BA. The cards, available on a subscription basis, can be easily read under a low-powered dissecting microscope. Subscriptions are available to individuals only, at a cost of $6 per year, for each of the 84 subject divisions; a maximum of ten different divisions may be subscribed to by any single person. The microcards will be published semimonthly. (Microform Unit, Biological Abstracts, Inc., 3815 Walnut St., Philadelphia, Pa. 19104)

Scientists in the News

The Royal Netherlands Academy of Sciences has awarded the first H. P. Heineken prize to **Erwin Chargaff**, Columbia University professor of biochemistry, for "noticeable achievements in the field of biochemistry." The award, established last year by the Heineken Foundation, carries an honorarium of 35,000 Dutch guilders, equal to about $10,000 in U.S. currency.

William J. Harrington, associate professor of medicine and director of the hematology division at Washington University school of medicine, St. Louis, Mo., has been appointed professor and chairman of the department of medicine in the University of Miami's medical school, as of 1 June.

University of Oregon biology professor **Edward Novitski**, has been appointed head of the school's biology department, effective 16 September. He will succeed **Bradley Scheer**, who plans to spend the 1964–65 school term on sabbatical leave in Italy.

Richard V. Kadison, mathematics professor at Columbia University, has been appointed Gustave C. Kuemmerle professor of mathematics at the University of Pennsylvania, as of 1 July.

James E. Birren has been appointed director of the Aging Program in the National Institute of Child Health and Human Development. He has been chief of the section on aging in the National Institute of Mental Health's laboratory of psychology.

Jan Langman, anatomy professor at McGill University, Montreal, has been appointed chairman of the anatomy department in the University of Virginia medical school, effective 1 September.

James L. Elliott, formerly assistant chief of the PHS Bureau of Medical Services, Bethesda, Md., has become medical director at the University of Pennsylvania hospital. He succeeds **John N. Bowden**, who is now the hospital's executive director.

Ray Hooker, chief of the research models and facilities division, Langley Research Center, Hampton, Va., has been named NASA's senior scientific representative in Australia. He is scheduled to leave in June for Melbourne.

John P. Eberhard, consultant to J. Herbert Hollomon, assistant secretary for science and technology at the Department of Commerce, has been appointed deputy director of the National Bureau of Standards' Institute for Applied Technology.

Carl W. Hall, professor of agricultural engineering at the Michigan State University, has been named chairman of the department, effective 30 June. He succeeds **A. W. Farrall**, who will retire as department chairman.

Joseph T. Velardo, director of the Institute for the Study of Human Reproduction, St. Ann Hospital, Cleveland, Ohio, and biology professor at John Carroll University, has been appointed editor of the *Journal of Continuing Medical Education.*

Thomas H. Hunter, on leave as dean of medicine at the University of Virginia, has been named the school's first chancellor for medical affairs. The new dean of medicine is **Kenneth R. Crispell**, acting dean; and **John R. Stacey**, director of the University Hospital, is the new director of the medical center.

Fred W. McLafferty, director of Dow Chemical Company's fundamental research laboratory, Framingham, Mass., has been appointed professor of analytical chemistry at Purdue University.

Victor C. Vaughan III, chairman of the pediatrics department at the Medical College of Georgia, has been named professor and chairman of the pediatrics department at Temple University medical school and St. Christopher's Hospital for Children.

Leo Szilard, professor of biophysics at the University of Chicago, has been appointed a resident fellow at the Salk Institute for Biological Studies, San Diego, Calif.

The American Chemical Society has presented its highest award, the Priestley Medal, to **John C. Bailar**, Jr., professor of inorganic chemistry at the University of Illinois.

Ivan A. Wolff, chief of the industrial crops laboratory, U.S. Department of Agriculture's Northern Utilization Research and Development Division, Peoria, Ill., has been elected president of the Society for Economic Botany.

The Optical Society of America's Adolph Lomb medal has been presented to **Gordon H. Spencer**, of Scientific Calculations, Inc., Rochester, N.Y., for his work in lens design.

Carl Levenson, medical director of the Moss Rehabilitation Hospital and director of the physical medicine and rehabilitation department at Albert Einstein Medical Center, has been appointed clinical professor of physical medicine and rehabilitation at Temple University's medical school, Philadelphia, Pa.

Fred S. Honkala, chairman of the geology department, Montana State University, has been appointed graduate dean of the university, and research director of the MSU Foundation, effective 1 July.

Recent Deaths

Cecil L. Brown, 65; recently retired manager of the office of scientific liaison, Esso Research Engineering, Linden, N.J., and newly appointed assistant program administrator in the division of research grants and fellowships, American Chemical Society; 27 April.

Rachel Carson, 56; author of *The Silent Spring*, which touched off a nationwide controversy over misuses of pesticides; 14 April.

Gerhard Domagk, 68, winner of the 1939 Nobel Prize in physiology and medicine for his discovery of protonsil, the first sulfonamide; 24 April.

Arthur Hill, Whitehead professor emeritus of organic chemistry at Yale University; 22 April.

Hugh E. Keeler, 75; professor emeritus of mechanical engineering at the University of Michigan; 21 April.

Charles Leutz, 65; retired senior staff member, Applied Physics Laboratory, Johns Hopkins University; 25 April.

James Persons Simonds, 85; professor emeritus and former chairman of the pathology department, Northwestern University medical school, Chicago, Ill.; 17 March.

Theodor Wanko, 40; head of the electron microscopy program, in the ophthalmology branch, National Institute of Neurological Diseases and Blindness; 3 April.

Joshua Whatmough, 67; retired chairman of the department of linguistics at Harvard University; 25 April.