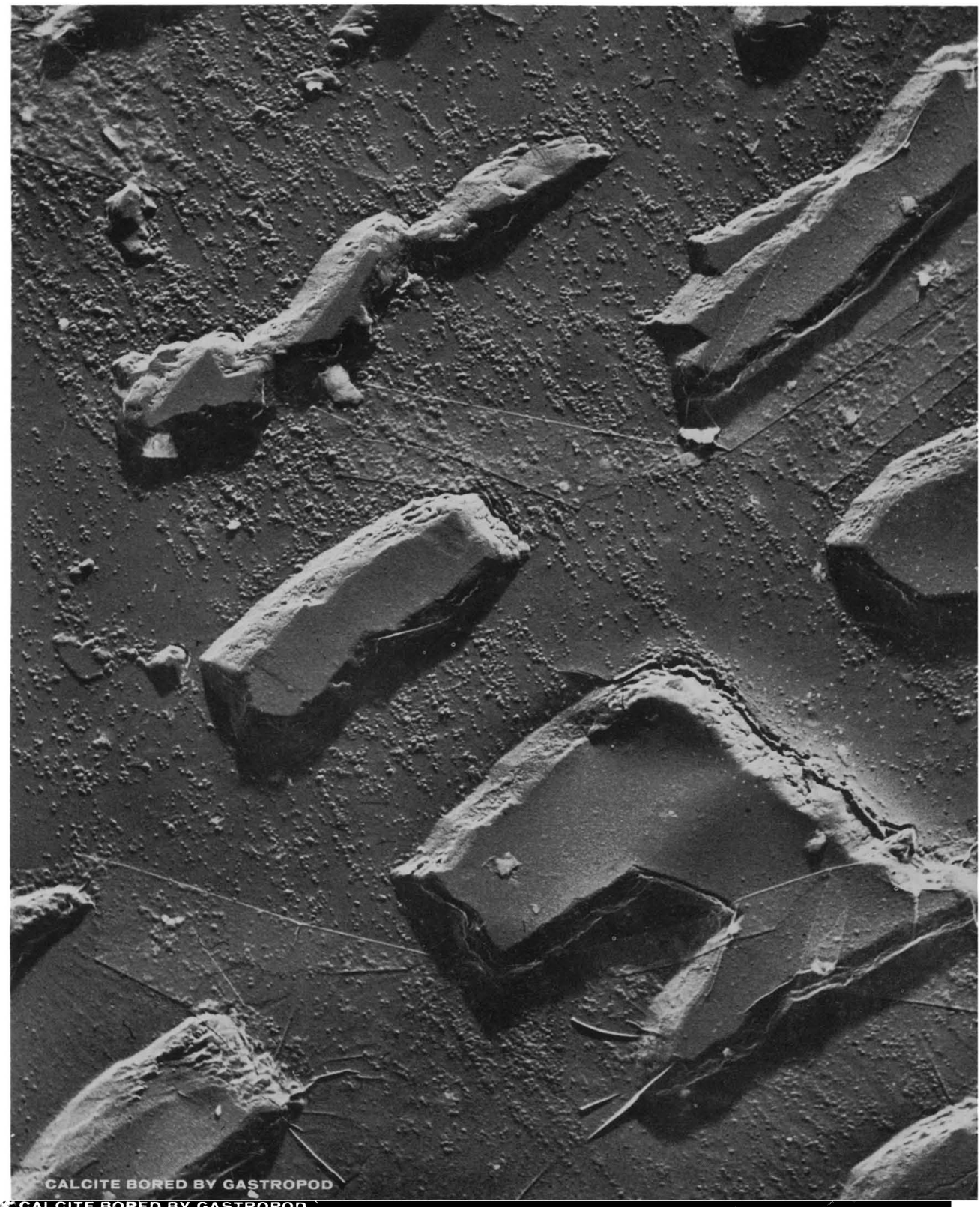
SCIENCE

1 March 1963

Vol. 139, No. 3557

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CALCITE BORED BY GASTROPOD

NEWS FROM
BELL TELEPHONE LABORATORIES

New high-purity alloys make better electron tubes

Ingot of high-purity nickel alloy is removed from controlled atmosphere melting furnace. Alloy is virtually free of impurities which inhibit electron emission. The new alloying technique and the methods for making cathodes and evaluating their electron-emitting properties were developed by K. M. Olsen and H. E. Kern.

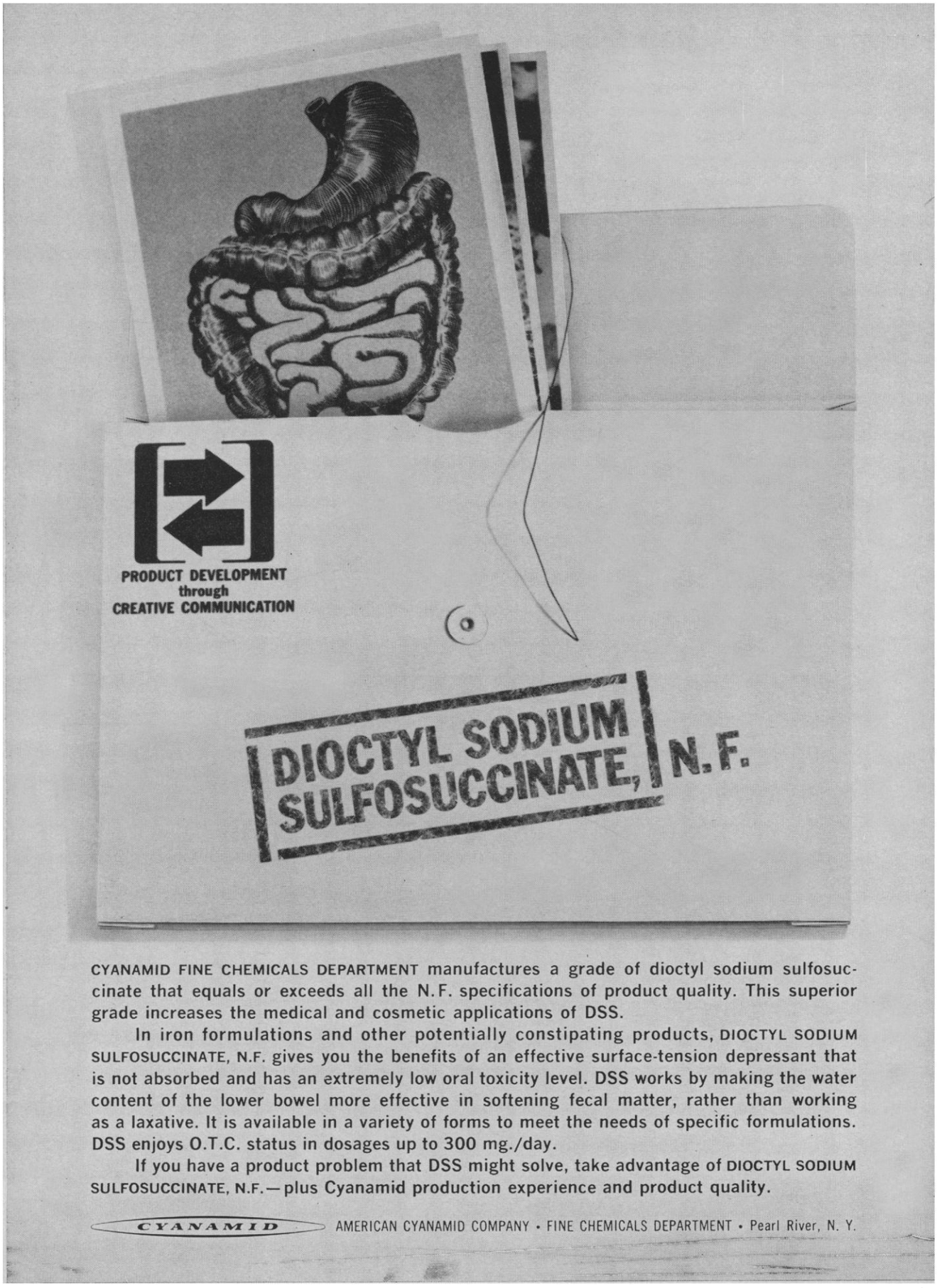
Scientists at Bell Telephone Laboratories have developed new high-purity nickel alloys which are proving highly effective in lengthening the life of advanced-design electron tubes used in the Bell System. This development meets the demand of new electronic technology for long life and high reliability in electron tubes.

One of the new alloys is now providing the outstanding performance required in the electron-emitting cathode of the traveling wave tube in the Telstar satellite.

The first step was to devise new means for the fabrication of ultra-pure nickel to eliminate those impurities harmful to cathode performance. It was then possible to add to the ultra-pure nickel the alloy constituents and activating agents desired for optimum cathode performance, and at the same time to hold the undesirable impurities at levels below 50 parts per million. These techniques involved purifying the nickel raw materials and melting, alloying and casting in controlled atmospheres of hydrogen and helium.

This development is an example of how metallurgical scientists work to improve communications. The new nickel alloys are now being produced by the Western Electric Company, manufacturing unit of the Bell System.

Bell Telephone Laboratories
World center of communications research and development



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1 March 1963
Vol. 139, No. 3557

SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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COVER

An electron micrograph made from a replica of pure calcite which had been subjected in vitro to the activity of the accessory boring organ excised from a snail *(Urosalpinx cinerea follyensis)*. In this experiment the gland was placed on the cleaved surface of a calcite crystal in order to determine whether the secretion is capable of attacking the mineral portion of the shell. The pitting (about ½ micron deep) of the normally smooth surface stands out clearly and is evidence that subsurface leaching out of minerals can take place even in the absence of a conchiolin matrix (× 11,000). See page 849.

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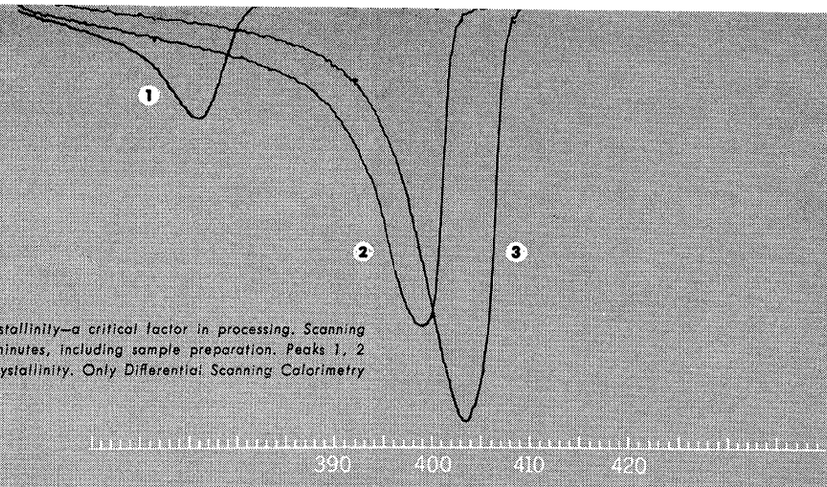

Comparison of three 6.7 mg. polyethylene samples for degree of crystallinity—a critical factor in processing. Scanning rate, 10° per minute; chart speed, .75" per minute. Total time, 45 minutes, including sample preparation. Peaks 1, 2 and 3 show respectively low, medium and high degrees of nominal crystallinity. Only Differential Scanning Calorimetry provides such information so rapidly.

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luring students into graduate school with increased subsidies seems ludicrous to us in view of the really small purchasing power of these stipends (surely not much above subsistence levels) as compared to the salary the student might earn if he went directly into the job market. Rather, the real issue raised by the support of graduate students is not whether the student will become soft but whether departments will become soft. The burden, as always, is upon the graduate departments to maintain a stimulating, challenging environment and enforce standards of achievement. It may very well be that, when faced with a larger number of students among whom to choose, many departments will be enabled to raise their standards, not tempted to lower them.

Finally, the editorial does not appreciate the broader social necessities implied in the recommendations of the President's Science Advisory Committee. As the technological base of our society becomes more complex and develops more and more rapidly, larger and larger proportions of our population must have higher education, including education beyond college. Of the larger numbers of students acquiring Ph.D.'s, perhaps only a small group, as in the past, will develop a real flair for scientific investigation and prove truly creative. The remainder will provide the good, solid work which is necessary to fill in data in an area which has been mapped out in broad outline by the "genius" in the forefront. If such scientists are not also being trained, a national emergency may arise, for there are many kinds of jobs to be filled in the vast vineyard of science and technology developing in our country today.

NEENA B. SCHWARTZ
RUE BUCHER
Department of Physiology, College of Medicine, University of Illinois, Chicago

The editorial "Manpower or mind power" [*Science* **139**, 79 (1963)] was excellent and said something badly in need of being said. The change in attitude of the graduate students (particularly in physics, which is my field) during the last 25 years is almost unbelievable. Most of them seem to have a conviction that their having elected to do advanced work is all that was needed for them to merit comfortable support for their families and themselves, and this with 40 hours' work (including coffee breaks) a week. This attitude has, I am sorry to say, been frequently given tacit approval by faculty members who build small empires on grants and contracts.

Science continues to advance rapidly, but I am convinced that this is due only to the tremendous increase in the number of persons involved, which compensates for the decrease in output of the individual, who is, in many cases, little more than a black-box manipulator and a collector of data of dubious significance. We seem to lack the truly great minds which in the past were, if not prevalent, at least not infrequent, and I even venture to doubt that the average scientist of today is as able intellectually as his predecessor of a hundred years or more ago.

I hope that your editorial will be read, absorbed, and heeded.

E. SCOTT BARR
University of Alabama, University

"Activated" Sleep in the Rat

Swisher [*Science* **138**, 1110 (1962)] has described for the rat a type of sleep that is analogous, perhaps, to the "activated" or "paradoxical" sleep that has been described by Jouvet, among others, for several species. One very striking feature of this state in the rat is the very regular electroencephalographic (EEG) activity of approximately 7 cy/sec.

Our own observations agree quite well with Swisher's in every respect but one: Swisher has noted that rats, unlike cats in paradoxical sleep, do not assume very relaxed postures, but rather undergo "shifts in muscle tone, occasionally of considerable magnitude." In our experiments, in which electromyograms were obtained for the rats' neck muscles, we have found that when the EEG displays very regular 7-cy/sec activity, the neck muscle potentials are much reduced, usually to about one-quarter the magnitude (root-mean-square values) of those found in sleep characterized by large, slow EEG potentials. Periods marked by the highly rhythmic EEG and very low neck muscle potentials are often terminated by movements which usually appear to be shifts in posture; however, during these periods no changes in electromyographic activity can be detected by electrodes located in the neck musculature.

R. D. HALL
Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge

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1 March 1963, Volume 139, Number 3557

SCIENCE

Aid to the U.S.

Information concerning the flow of trained scientists and engineers to the United States has recently been summarized in a National Science Foundation report, and information on immigration of all classes of workers, in a Department of Labor report. In the 10 years from 1952 through 1961, 30,000 trained engineers migrated to the U.S. So did 9000 natural scientists (with the equivalent of a bachelor's degree or higher), 14,000 physicians and surgeons, 28,000 nurses, 12,000 technicians, and 16,000 skilled machinists and tool and die makers. One can compute the meaning of some of these figures in several ways.

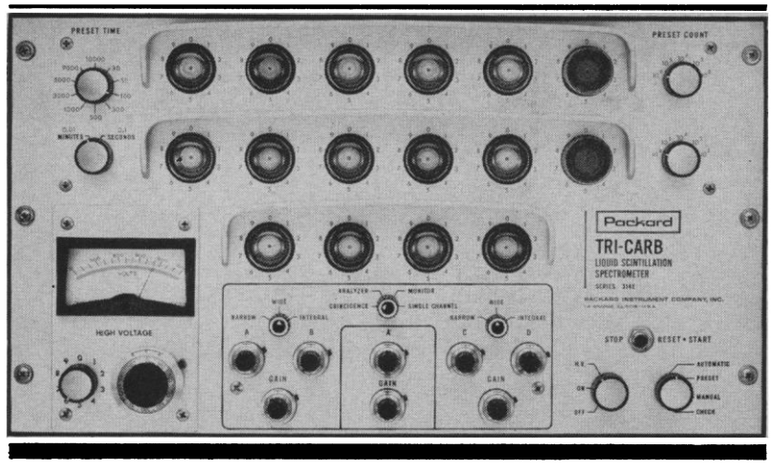
In numbers. The 30,000 engineers are nearly as many as will graduate this year from U.S. schools of engineering; in the past 10 years they have augmented our own graduates by 10 percent.

In dollars. The total cost of rearing a child and educating him through college can be estimated—in very round numbers—at $35,000. At this rate, the investment in the 39,000 scientists and engineers who have come here in the 10-year period comes to 1¼ billion dollars. The cost of rearing and training the other groups enumerated above can be estimated at about 2¼ billion dollars. We have been saved these amounts of money, for the immigrants have come in their productive years, ready to add, to the amount saved, the value of the contributions they will make to industrial production, research, and education. By the time they retire, their contribution will be large indeed.

In enriching the labor force. The Department of Labor report compares all immigrants with our total labor force and demonstrates that the mixture is enriched by immigration. The immigrant group includes relatively more professional and technical personnel and more craftsmen than does the labor force at large.

At the top level in science—and now we are no longer considering only the period since 1952—migrants from other countries have greatly enriched the United States. The Hungarians are proverbial. But consider also the distinguished contributions of American scientists who once were Chinese, or German, or British, or of some other national origin. Turning from anecdotal to statistical evidence of the enrichment brought by immigration, we find that 17 percent of the members of the National Academy of Sciences were born and educated abroad, and an additional 7 percent were born abroad but received a good portion of their education here. Over 60 Americans have received the Nobel Prize in physics, chemistry, or physiology or medicine. A fourth of them were born in other countries.

Too many factors are involved for us to try to draw up here a balance sheet of scientific and technological credits and debits, but in considering the various kinds of aid this country offers to other peoples, we do well to remember that American science and engineering profit greatly from the contributions of men and women who come here from other countries.—D.W.



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Forthcoming Events

March

20–22. **Bone Dynamics,** intern. symp., Detroit, Mich. (H. M. Frost, Dept. of Orthopaedic Surgery, Henry Ford Hospital, Detroit 2)

20–29. **Quantitative Spectroscopy** at Elevated Temperatures and Selected Applications in Space Science. Pasadena, Calif. (D. L. Wennersten, Air Force Office of Scientific Research, Washington 25)

21–24. International Assoc. for **Dental Research,** 41st annual, Pittsburgh, Pa. (J. Muhler, 1120 W. Michigan St., Indianapolis 2, Ind.)

21–24. International College of **Applied Nutrition,** Pasadena, Calif. (D. C. Collins, 7046 Hollywood Blvd., Suite 503, Los Angeles 28, Calif.)

24–28. Institute of **Radio Engineers,** intern. convention. New York, N.Y. (G. W. Bailey, 1 E. 79 St., New York)

25–27. High Frequency **Communication,** convention. London, England. (Secretary, Institution of Electrical Engineers, Savoy Pl., London, W.C.2)

25–28. American Association of **Petroleum Geologists,** 48th annual, Houston, Tex. (J. M. Parker, Kirby Petroleum Co., 518 Patterson Building, Denver 2, Colo.)

25–28. Society of Economic **Paleontologists and Mineralogists,** Houston, Tex. (L. C. Pray, Ohio Oil Co., Box 269, Littleton, Colo.)

26–28. Japan **Atomic Industrial** Forum/ United Kingdom Atomic Energy Authority, nuclear power symp., Tokyo, Japan. (UKAEA, 11 Charles II St., London, S.W.1, England)

27–28. **Drugs and Animal Behaviour,** symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

27–29. **Photochemistry,** intern. symp., Rochester, N.Y. (W. H. Wyatt, Air Force Office of Scientific Research, Washington 25)

28–29. Evolution of the **Atherosclerotic Plaque,** intern. symp., Chicago, Ill. (Miss M. Brookes, Chicago Heart Assoc., 22 W. Madison St., Chicago 2)

28–30. Natl. Soc. for **Programmed Instruction,** annual, San Antonio, Tex. (NSPI, Trinity University, 715 Stadium Dr., San Antonio 12, Texas)

29–31. American **Ethnological Soc.,** Ithaca, N.Y. (E. Friedl, Queens College, Flushing 67, N.Y.)

29–31. American Soc. of **Internal Medicine,** annual, Denver, Colo. (ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

31–4. National **Science Teachers** Assoc., natl. convention, Philadelphia, Pa. (R. H. Carleton, NSTA, 1201 16th St., NW, Washington 6)

31–5. American **Chemical** Soc., natl., Los Angeles, Calif. (A T. Winstead, ACS, 1155 16th St., NW, Washington 6)

31–5. National Assoc. of **Recreational Therapists,** annual, Norman, Okla. (American Psychiatric Assoc., 1700 18th St., NW, Washington 9)

April

1–2. **Process Automation,** 5th symp., Santa Monica, Calif. (D. Kader, P.O. Box 1065, Canoga Park, Calif.)

1–3. Oak Ridge **Radioisotope** Conf.—Applications to Physical Science and Engineering, Gatlinburg, Tenn. (Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn.)

1–4. American **Radium Soc.,** annual, White Sulphur Springs, W. Va. (C. G. Stetson, ARS, Dept. of Radiology, Englewood Hospital, Englewood, N.J.)

1–5. American College of **Physicians,** Denver, Colo. (E. C. Rosenow, Jr., 4200 Pine St., Philadelphia 4, Pa.)

1–27. World **Meteorological** Organization, 4th congr., Geneva, Switzerland. (Secretariat, WMO, 41 Avenue Guiseppe Motta, Geneva)

2–6. **Psychology,** 8th Inter-American congr., Mar La Plata, Argentina. (G. M. Gilbert, Psychology Dept., Long Island Univ., Brooklyn 1, N.Y.)

3–5. American Soc. of **Internal Medicine,** annual, Atlantic City, N.J. (ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

3–5. **Streamflow Regulation** for Quality Control, symp., Cincinnati, Ohio. (J. E. McLean, Field Operations Section, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Pkwy., Cincinnati 26)

3–6. National Council of Teachers of **Mathematics,** Pittsburgh, Pa. (M. H. Ahrendt, 1201 16 St., NW, Washington 6)

4–5. Agricultural **Meteorology,** 5th natl. conf., Lakeland, Fla. (American Meteorological Soc., 45 Beacon St., Boston 8, Mass.)

4–5. **Systems,** 2nd symp., Cleveland, Ohio. (M. Mesarovic, Case Inst. of Technology, University Circle, Cleveland 6)

4–6. International Assoc. for **Dental Research,** British section, 11th annual, London, England. (C. Tonge, Dept. of Anatomy, King's College Medical School, Newcastle upon Tyne 1, England)

4–6. Latin **Medical** Conf., Rome, Italy. (Prof. Urso, Policlinico Umberto 1, Viale Policlinico, Rome)

5–6. Alabama **Acad. of Science,** Tuscaloosa. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

6. **Paleontological Research** Inst., Ithaca, N.Y. (R. Harris, PRI, 109 Dearborn Pl., Ithaca)

7–9. Royal Microscopical Soc., Bethesda, Md. (M. C. Brown, 4409 Glenridge St., Kensington, Md.)

7–13. Panamerican **Diabetic** Congr., 2nd, Chicago, Ill. (Diabetic Inst. of America, Inc., Suite 1646, Chicago 2, Ill.)

8–10. American Assoc. for **Thoracic Surgery,** 43rd, Houston, Tex. (AATS, 7730 Carondelet Ave., St. Louis, Mo.)

8–10. **Feedback Mechanisms in the Nervous System,** Villahermosa, Mexico. (E. Eidelberg, Div. of Neurobiology, St. Joseph's Hospital, 350 W. Thomas Rd., Phoenix, Ariz.)

8–10. **Seismological** Soc. of America, Berkeley, Calif. (K. V. Steinbrugge, 465 California St., San Francisco 4, Calif.)

8–11. American **College Personnel** Assoc., Boston, Mass. (B. A. Kirk, Counseling Center, Univ. of California, Berkeley 4)

9–11, American Assoc. of **Anatomists**, Washington, D.C. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia)

10–11. Engineering Aspects of **Magnetohydrodynamics**, 4th symp., Berkeley, Calif. (G. S. Janes, Avco-Everett Research Laboratory, Everett 49, Mass.)

11–13. Natural **Radiation** Environment, intern. symp., Houston, Tex. (J. A. S. Adams, Dept. of Geology, Rice Univ., P.O. Box 1892, Houston 1)

11–13. Eastern **Psychological** Assoc., 34th annual, New York, N.Y. (M. A. Iverson, Dept. of Psychology, Queens College of the City University of New York, Flushing 67)

11–13. **Pulsatile Blood Flow**, intern. symp., Philadelphia, Pa. (E. O. Attinger, Presbyterian Hospital in Philadelphia, 51 N. 39 St., Philadelphia 4)

11–13. Southern Soc. for **Philosophy and Psychology**, Miami Beach, Fla. (E. A. Alluisi, Human Factors Research Lab., Lockheed Georgia Co., Marietta, Ga.)

12–13. Pennsylvania **Acad. of Science**, East Stroudsburg, (K. B. Hoover, Messiah College, Grantham, Pa.)

14–18. **Electrochemical** Soc., Pittsburgh, Pa. (ES, 30 E. 42 St., New York 17)

15–16. American Soc. for **Artificial Internal Organs**, annual, Atlantic City, N.J. (B. K. Kusserow, Medical College of Vermont, Burlington)

15–20. Association for Research into **Periodontal Diseases**, 17th intern., Athens, Greece. (O. Louridis, ARPA, 8 rue Hippocratous, Athens)

16–18. **Optical Masers**, intern. symp., New York, N.Y. (L. Bergstein. Symp. Committee, Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

16–19. USAF **Aerospace Fluids and Lubricants** Conf. (unclassified), San Antonio, Tex. (J. Harmon, Southwest Research Inst., 8500 Culebra Rd., San Antonio)

16–20. American **Physiological** Soc., Atlantic City, N.J. (H. Rahn, Dept. of Physiology, Univ. of Buffalo, Buffalo 14, N.Y.)

16–20. British Inst. of **Radio Engineers**, Southampton, England. (BIRE, 9 Bedford Sq., London, W.C.1, England)

16–20. Federation of American Societies for **Experimental Biology**, annual, Atlantic City, N.J. (M. O. Lee, 9650 Wisconsin Ave., NW, Washington 14)

16–21. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (K. M. Brinkhous, Dept. of Pathology, Univ. of North Carolina, Chapel Hill)

16–21. American Inst. of **Nutrition**, Atlantic City, N.J. (A. E. Schaefer, Bldg. 16, Rm. 207, NIH, Bethesda 14, Md.)

16–24. **Forensic Immunology, Medicine, Pathology, and Toxicology**, 3rd intern. meeting, London, England. (I. Sunshine, 2121 Adelbert Rd., Cleveland, Ohio)

17–19. Institute of **Environmental Sciences**, technical meeting and equipment exposition, Los Angeles, Calif. (Natl. Office, P.O. Box 191, Mt. Prospect, Ill.)

17–19. **Institute of Physics and the Physical Society**/Joint British Committee for Vacuum Science and Technology, conf., Liverpool, England (Inst. of Physics, 47 Belgrave Sq., London, S.W.1, England)

(See 15 February issue for comprehensive list)

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