The Long Pull

The launching of the sputniks in October and November brought to a much wider public the realization that the Soviet Union has attained a high level of scientific and engineering competence. Neither the existence of this competence nor the methods by which it has been attained is news to those American scientists who have visited the Soviet Union in recent years or to those who have followed the Soviet scientific literature. The methods are simple and straightforward: education in the sciences and mathematics in the schools and universities is intense and prolonged; all who show talent in the sciences have an opportunity to go into more advanced work; those who attain professional standing are handsomely rewarded both in material benefits and status in the community; research, both basic and applied, is strongly supported.

The challenge to this country cannot be met, except perhaps on a short-term basis, by crash programs in particular enterprises or by shifting scientists and engineers from one project to another. What is needed to prevent us from slipping into a secondary position in science and technology over the long pull of the next ten to twenty years is a thorough reform of our educational system from grade school through college and a means of assuring that talented students are not barred from higher education for reasons of race, religion, or financial resources.

Reform, if it is to come, will require, among other things, radical changes in the public attitude toward intellectual accomplishment and a willingness to provide adequate pay and status for teachers. Certainly, such reform should be our long-term goal, but a more immediate gain can be effected by making an effort to remove the financial barrier that now bars some 100,000 well-qualified high school graduates from further education each year. The costs of education have been steadily rising, and some of the increased costs have been passed on to students even in the state universities. Many of the state universities were originally tuition-free on the assumption that society was the beneficiary of education and that a democratic society should not put financial barriers in the way of its economically less favored families. The trend away from free tuition is based on the premise that students benefit from higher education and that they will appreciate education more if they pay for it.

The President's Committee on Education Beyond the High School (Second Report to the President) has, in the main, favored the last set of assumptions. It recommends that the needs of students for financial support be met by private, local, and state scholarships, by federally supported "work-study" programs, by credits on income tax for educational expenditures, and by the provision of privately financed loans at low rates of interest to students or parents.

All of these measures are good as far as they go, but is the committee wise in rejecting for the present a Federal scholarship program? The committee notes the recent expansion of scholarship support by industry, labor unions, and state and local governments. It adds, "If these programs should later prove to be inadequate, the Committee believes a Federal scholarship program to fill the gap is inevitable." But recent events have put a premium on time. Can we afford to lose tens of thousands of talented people from higher education each year while we wait to see whether or not private sources can foot the bill?—G. DuS.
A GREAT AMPLIFIER TUBE IS PERFECTED FOR TELEPHONY

A new transcontinental microwave system capable of carrying four times as much information as any previous microwave system is under development at Bell Laboratories. A master key to this development is a new traveling-wave tube of large frequency bandwidth.

The traveling-wave amplifying principle was discovered in England by Dr. Rudolf Kompfner, who is now at Bell Laboratories; the fundamental theory was largely developed by Labs scientist Dr. John Pierce. Subsequently the tube has been utilized in various ways both here and abroad. At the Laboratories it has been perfected to meet the exacting performance standards of long distance telephony. And now for the first time a traveling-wave tube will go into large-scale production for use in our nation’s telephone systems.

The new amplifier’s tremendous bandwidth greatly simplifies the practical problem of operating and maintaining microwave communications. For example, in the proposed transcontinental system, as many as 16 different one-way radio channels will be used to transmit a capacity load of more than 11,000 conversations or 12 television programs and 2500 conversations. Formerly it would have been necessary to tune several amplifier tubes to match each channel. In contrast, a single traveling-wave tube can supply all the amplification needed for a channel. Tubes can be interchanged with only very minor adjustments.

The new amplifier is another example of how Bell Laboratories research creates new devices and new systems for telephony.

Left: A traveling-wave tube. Right: Tube being placed in position between the permanent magnets which focus the electron beam. The tube supplies uniform and distortionless amplification of FM signals over a 500 Mc band. It will be used to deliver an output of five watts.

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National Geographic Society. Annual lecture and color film: “The Bounty and Pitcairn Island,” by Lus Marden, National Geographic Magazine; 29 Dec., evening; Paul A. Scherer, Carnegie In- stitution of Washington, presiding.

National Speleological Society. Con- tributed papers, 28 Dec., morning.


Forthcoming Events

December

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The following 44 meetings are being held in conjunction with the AAAS annual meeting.

AAAS Acad. Conference, annual (Father P. H. Yancey, Spring Hill College, Mobile, Ala.). 28-Dec.


American Geophysical Union (E. M. Brooks, Dept. of Geophysics, St. Louis Univ., St. Louis 8, Mo.).

American Medical Assoc. Committee on Cosmetics (Mrs. V. L. Conley, AMA, 535 N. Dearborn St., Chicago, Ill.). 29-29 Dec.

American Meteorological Soc. (K. C. Spengler, AMS, 3 Joy St., Boston, Mass.).


American Physiological Soc. (F. A. Hitchcock, Dept. of Physiology, Ohio State Univ., Columbus 10.)


28 Dec.

American Statistical Assoc. (V. L. Anderson, Statistical Lab., Purdue Univ., Lafayette, Ind.).


How To Get Things Done Better And Faster
Association for Computing Machinery (J. E. Robertson, Digital Computer Lab., Univ. of Illinois, Urbana).

Astronomical League (W. Garnatz 2506 South East St., Indianapolis).

Beta Beta Beta (Mrs. F. G. Brooks, P.O. Box 336, Madison Sq. Station, New York 10). 27 Dec.


Ecological Soc. of America (A. Lindsey, Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.). 27-29 Dec.

Metric Assoc. (J. T. Johnson, 694 West 11 St., Claremont, Calif.).


National Assoc. of Science Writers (J. T. Troan, Pittsburgh Press, Pittsburgh, Pa.).


Philosophy of Science Assoc. (G. W. Churchman, Case Inst. of Technology, Cleveland, Ohio).


Sigma Delta Epsilon, annual (Miss M. Chalmers, Dept. of Chemistry, Purdue Univ., Lafayette, Ind.). 26-30 Dec.


Society for General Systems Research, annual (R. L. Meier, Mental Health Research Inst., Ann Arbor, Mich.).


Society for Investigative Dermatology (H. Beerman, Univ. of Pennsylvania School of Medicine, Philadelphia 5). 28-29 Dec.

Society of the Sigma Xi, annual (T. T.

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28-30. Archaeological Inst. of America, annual, Washington, D.C. (C. Boulter, 608, Univ. of Cincinnati Library, Cincinnati 21, Ohio.)


January

6-8. Reliability and Quality Control, 4th natl. symp., Washington, D.C. (C. M. Ryerson, RCA Bldg. 10-6, Camden 2, N.J.)

7-10. Radioactive Isotopes in Clinical Application and Research, 3rd internat. symp., Bad Gastein, Austria. (Second Medical Clinic, Vienna Univ., Vienna, Austria.)


22-24. American Council of Learned Societies, 39th annual, Bloomington, Ind. (ACLS, 2101 R St., New York 8.)


28-30. American Mathematical Soc., 64th annual, Cincinnati, Ohio. (J. H. Curtiss, AMS, 190 Hope St., Providence 6, R.I.)


30-1. American Assoc. of Physics Teachers, New York. (F. Verbrugge, Univ. of Minnesota, Minneapolis.)

30-1. Western Soc. for Clinical Research, 11th annual, Carmel-by-the-Sea, Calif. (A. J. Seaman, Univ. of Oregon Medical School, Portland 1.)

31. Mathematical Assoc. of America, annual, Cincinnati, Ohio. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

February


3-4. Progress and Trends in Chemical and Petroleum Instrumentation, Wilmington, Del. (H. S. Kindler, Instrument Soc. of America, 315 Sixth Ave., Pittsburgh 22, Pa.)


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EQUIPMENT NEWS

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Science does not assume responsibility for the accuracy of the information. All inquiries concerning items listed should be addressed to Science, Room 740, 11 W. 42 St., New York 36, N.Y. Include the name(s) of the manufacturer(s) and the department number(s).

- Humidity controller maintains constant humidity within ±0.25 percent relative humidity in an air or gas stream. The unit comprises a sensing element, control system, and modulating device. Sizes ranging from one with a capacity of 20 ft³/min are available. The control point is set by a knob. Operation is accurate in the humidity range from 3 to 98 percent. (Universal Dynamics Corp., Dept. S724)

- Sterilizer is said to provide complete dry-heat sterilization 5 min after proper temperature has been reached. Trays for equipment, three in number, measure 7¾ by 13¾ in. (Associated Mills, Dept. S729)

- Vacuum-fusion apparatus provides direct analysis of hydrogen and oxygen in alloys, nitrogen being determined by difference. Both vacuum-fusion and high-temperature extraction can be used. Oxygen analysis is performed in an auxiliary apparatus which connects through a ball-and-socket joint. Oxides in the sample react with graphite to produce CO, which is further oxidized to CO₂ and measured. Hydrogen concentration from 0.1 to 2000 parts per million is measurable. The hydrogen is separated by diffusion through palladium and measured volumetrically. Results are said to be accurate to ±0.2 part per million. (Fisher Scientific Co., Dept. S743)

- Liquid-nitrogen refrigerator is a special container designed to permit storage baskets filled with material to be lowered into the liquid nitrogen. The unit weighs 115 lb fully charged and 60 lb empty. A single charge of liquid nitrogen will maintain a temperature of -320° for up to 34 days. (Union Carbide Corp., Dept. S741)

- Electron accelerator is designed for use in research on the effects of radiation on chemical, food, drug, and electronic products. High-energy electrons, x-rays, or neutrons are provided as desired. The electron beam is variable in energy from 2 to 10 Mev. Full power is 4 kw. The beam is pulsed, with energy per pulse variable to a maximum of 11 joules. The x-ray dose is variable to $5 \times 10^8$ r/min. Maximum total neutron production, through $(\gamma, n)$ reaction in a beryllium tar-
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