

mer US congressman from Michigan, will present "A Congressional View" of policy trends; J. E. Goldman, director of the Ford Motor Co Scientific Laboratory, "An Industrial View" and O. M. Solandt, chairman of the Science Council of Canada, "A Canadian View."

Thursday morning the associates will hear Peter A. Franken on "Are the Laser Frontiers Visible?", Raymond Bowers on "Transmission of Electromagnetic Waves Through Metals," William Fairbank on "Gyroscopic Test in Space of Einstein's General Theory of Relativity" and John R. Platt on "Biophysics of Perception."

In the afternoon Robert Herman will discuss the science of vehicular traffic, Edward A. Mason will report on agro-industrial complexes, and Luis W. Alvarez will detail pyramid exploration. Edward Creutz will preside in the morning and Ralph A. Sawyer in the afternoon. The meeting will include about 150 top executives from industry, as well as academic leaders.

In a concluding session Friday morning at the Hotel Roosevelt, AIP Governing Board members, society officers and AIP staff will discuss institute programs and areas of development.

Physics Enrollments Rise; Percentage Drop Continues

The number of undergraduates majoring in physics rose during the last academic year for the second year in a row, according to a year-end summary by the American Institute of Physics. Many of those who were graduated are expected to be drafted, however; the full impact of the revised draft laws will not be known until classes resume.

At the end of the 1967-68 year, 14 526 juniors and seniors were majoring in physics, an increase of 1189 over the year before. Graduate enrollment, however, had leveled off at 15 305. Ratio of physics student to total enrollments continued to drop. In September 1960 juniors majoring in physics constituted 1.78% of their own freshman classes. In September, 1967, this figure had dropped to 0.94% and was expected to drop to 0.82% this month.

The survey was part of the project for the Analysis of Education and Manpower Data in Physics, of the

AIP Education and Manpower Division. Enrollments were broken down into geographical regions, revealing a continuing concentration of physics study on both coasts. The highest number of physics students, 6242, was found in the Mid-Atlantic region (New York, New Jersey and Pennsylvania). The East-North Central region (Illinois, Indiana, Michigan, Ohio and Wisconsin) tallied 5325 while the Pacific region (California, Oregon, Washington, Alaska and Hawaii) reported 4118.

Summaries of enrollments and degrees granted, including a breakdown of degrees awarded since 1952, are available from Mrs Susanne D. Ellis at AIP.

Oxford Instrument Imports US Business Approach to UK

The Route-128 route to setting up small scientific companies is still a rocky road in England. One physics-based company, the Oxford Instrument Co. Ltd, is helping pave the way and is proving that a few technical people can run a successful business.

Oxford Instrument has after nine years in business managed to attract the necessary venture capital and to offer the variety of wares required for commercial stability. It was a difficult climb to success, but along the way the company won a "Queen's Award for Industry," built the first high-field superconductive magnet outside the US, became the first company to build a quadrupole superconduc-

tive magnet and developed the coldest refrigerator in the world, a cryogenic unit that operates within one tenth of a Kelvin of absolute zero.

It all started in 1959 when Martin Wood, then a research engineer at the Clarendon Laboratory at Oxford University, decided there was a limited but unsatisfied market for high-field iron-free magnets, the kind of magnet needed for research in the big physics laboratories. Such an opportunity was the start of many of today's successful American corporations. With his wife Audrey and Joseph Milligan, a retired Clarendon technician, Wood set up shop in a garden shed. The first financial support was supplied by local bankers more on the basis of personal acquaintance than of rosy business prospects, a far cry from the variety of venture-capital sources that have been available to fledgling scientist-businessmen in the US.

By 1961 the company had a few successful projects behind it but was still more a weekend hobby than a fully commercial company. At this time the development of high-field superconductors in the US pointed to a closely related new technology that promised to become a rapidly expanding international market. So the Woods, making the crucial decision to enter this new market, incorporated the company and set about the problems of growth, still on the basis of short-term financial arrangements. In 1963 the first full-time employee, John Rackstraw, now in charge of all production, arrived and was soon fol-

RESONANCES

The Weston accelerator can proceed on schedule now that Congress has appropriated \$12 074 000 for 1969 and removed the House-passed prohibition on construction this year. With carryover funds of \$2.5 million, Weston has double the \$7.1 million approved earlier by the House.

Planetary exploration is running into financial snags. A report by the National Academy of Sciences urges unmanned missions every time Mars and Venus are favorably positioned and Martian orbiting-landing flights. But the National Aeronautics and Space Administration says it must lower its sights because of budget cuts: The instrumentation for its 1973 Mars landing is "substantially less" than envisioned a few months ago.

US conversion to the metric system will be studied under a bill recently passed by Congress. The US will bring up the rear: Great Britain begins converting in 1975.

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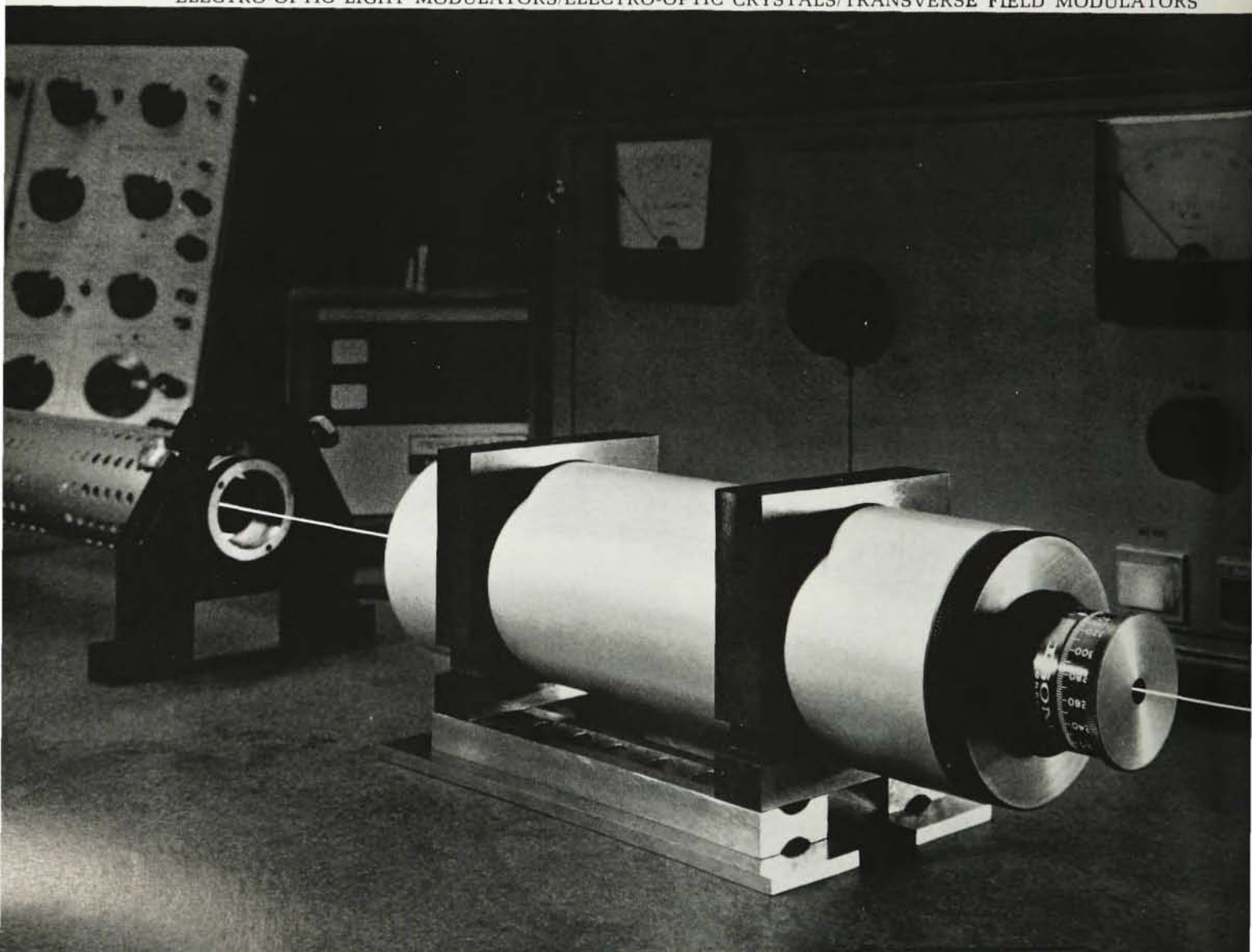
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lowed by a physicist, Frank Thornton, who is now managing director.

The next years brought many problems, from technical worries to the search for adequate quarters, and the sort of growing pains that have spelled bankruptcy to many under-capitalized concerns. But last year, soon after winning the Queen's Award for technical innovations, the financial picture changed. Technical Development Capital Ltd, a venture-capital firm backed by a consortium of banks became aware of Oxford Instrument and made available long-term debenture financing on acceptable terms while buying a minority interest.

Early in 1962, the year following incorporation and entry into cryogenics, the first high-field superconductive magnet to be made outside the US was finished and work was begun on the design of magnets with fields over 100 kilogauss. Now superconductive magnets represent more than half of the company's annual sales, although copper magnets are still made for certain important application that can not be met by superconductors.

Work with superconductive magnets led the company logically into development of other low-temperature devices. Oxford Instrument began making a variety of cryostats, including some with windows for optical

and x-ray work and some providing variable-temperature access to superconductive magnets. And work with cryostats led to work on cryogenic refrigerators. The company developed, under license from the United Kingdom Atomic Energy Authority, the "Harwell" refrigerator, which uses the He^3/He^4 dilution cycle. Simply stated, this cycle harnesses the cooling effect of "evaporating" liquid He^3 into superfluid He^4 . The minimum continuous temperature so far reached is 0.014K and heat exchanger refinements will continue to push that figure even closer to absolute zero.

Now the company has moved from North Oxford, where it was housed in a converted slaughter house since 1961, to Osney Mead, an industrial park only a mile from the center of Oxford. It has grown from a three-person adventure into a venture employing 70 people. About a third of the staff have university degrees or the equivalent, which is helpful to Wood. He feels that with this high ratio of degree holders company actions are much better understood at all company levels, new ideas are constantly forthcoming and decisions are often taken on the spot because the man on the spot knows what the problem is all about. A number of senior staff members own small shares in the company's equity.

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MARTIN WOOD, HEAD OF OXFORD INSTRUMENT CO., directs manufacture of superconductive quadrupole magnet for CERN, the first such unit built commercially.

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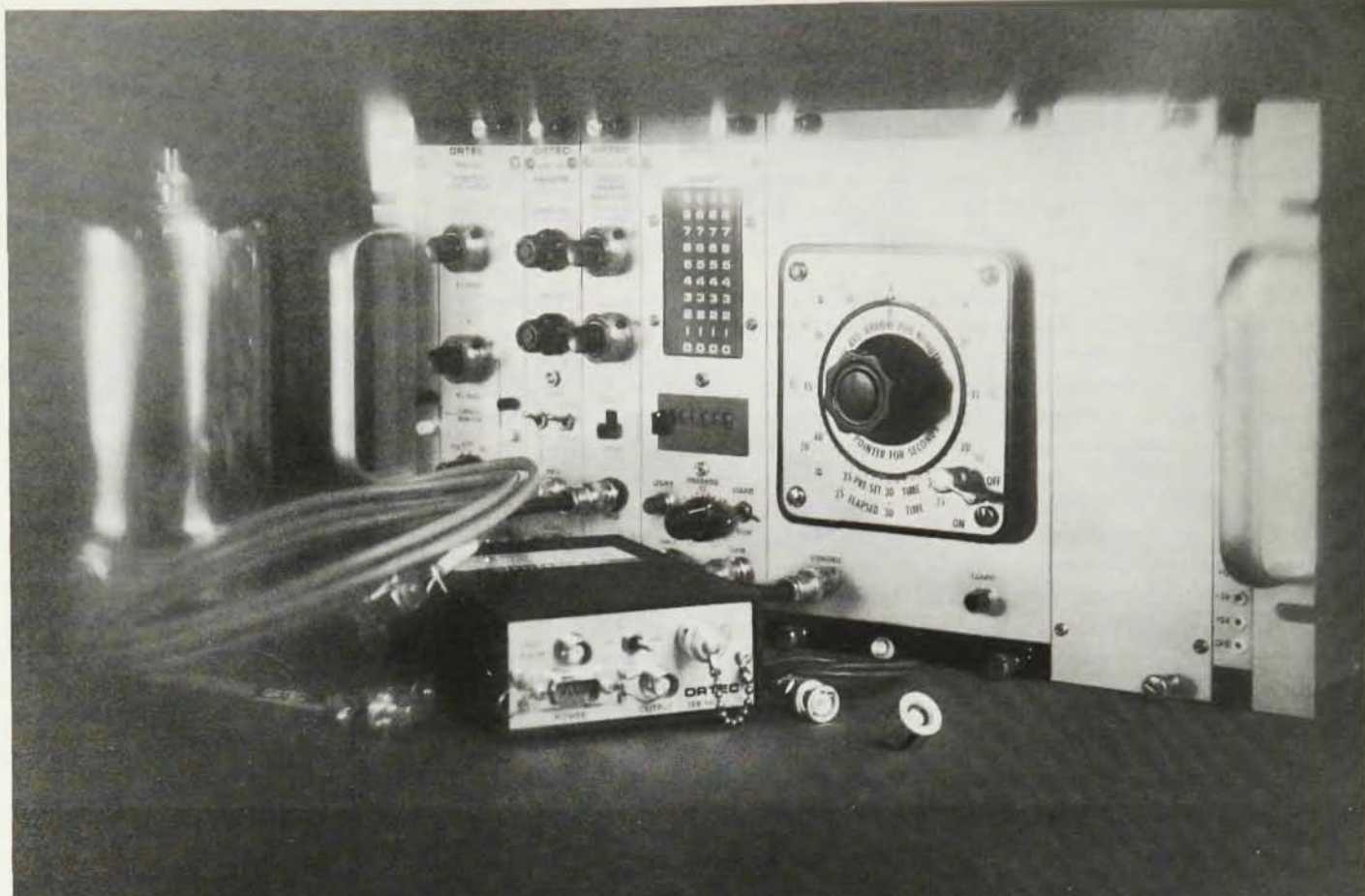
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world-wide. It has installed its first Harwell refrigerator in Berkeley, Calif., and has established an American subsidiary, Oxford Instrument Corp., to look after North American customers. Along with equipping nearly every British university with superconductive magnets, the company has sent its first such magnet to Japan. It is building and 50-kilogauss quadrupole magnet for CERN, Geneva, under a \$60 000 contract placed by Britain's Ministry of Technology. Experience gained in these endeavors gives the company the strong basis needed for future advances. For example, Wood has formed two new companies in Oxford to do for the medical equipment and electronic fields what Oxford Instrument has done for cryogenics.

IN BRIEF

The Visiting Scientist Program resumes this month; applications for participation are being mailed to all eligible physics departments. These should be returned to AIP by 1 Oct. The Optical Society of America will raise the subscription price of *Applied Optics* in January. Members will pay \$12 instead of \$10; non-members will pay \$24 instead of \$15.

NEW PUBLICATIONS

American Science Manpower, 1966, a final compilation of scientists' education, specialization by work activity and field, type of employer, salary, age, geographic location and other characteristics, is available from the Government Printing Office, Washington, D. C. 20402, at \$1.25 a copy.

Reprints of papers in information by staff members at the American Institute of Physics are now available from AIP. "Abstracting and Indexing Service in the Physical Sciences" (Publication ID 68-7) by Stella Keenan is reprinted from *Library Trends*. "Techniques for Publication and Distribution of Information" (ID 68-8) by AIP staff is reprinted from the *Annual Review of Information Science and Technology*. AIP also has published a bibliography of its information division reports issued since 1962 (ID 68-9). □

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