that if one is interested in gaining information from Soviet officials, the best approach is to ask, not how things work, but, rather, whether this is the way things work. If the questioner can show an official that he is fairly well informed, he has a better chance of getting an answer. If the reports are correct, American scientists attempting, for example, to arrange an exchange of scientific publications might well take advantage of the new system for handling scientific information in the U.S.S.R.

Cooper Union's Second Century

The 100th anniversary of The Cooper Union for the Advancement of Science and Art in New York was celebrated on 2 November. Delegates of about 300 educational institutions and societies marched in the academic procession that opened the centennial observance.

In the course of sessions on "New Values in Science, Art, and Society," Laurence M. Gould, geologist and president of Carleton College, spoke on "Education and Society," and Sir Kenneth Clark, art critic and historian and chairman of the Arts Council of Great Britain, discussed "Art and Society." Two recipients of Nobel Prizes shared an afternoon session devoted to "Science and Society." They were Sir John Cockcroft, physicist member of the United Kingdom Atomic Energy Authority and master designate of the new Churchill College of Cambridge University, and Harold C. Urey, professor-at-large of chemistry at the University of California, La Jolla.

Cooper Union is the oldest tuition-free, private educational institution in the United States. It consists of a day and evening school of engineering, a day and evening school of art and architecture, an adult education division, a museum for the arts of decoration, and a library.

The Union's undergraduate schools of engineering and art are open to all residents of the United States, regardless of race, religion, or sex, who qualify in the competition for admission. Talent and intellectual ability are the basic requirements for entrance. Of the 1597 applicants tested in 1958, 396 were accepted; this brought the current enrollment to 1300.

Since its founding, Cooper Union has offered free public lectures and programs. Its evening forums attract audiences of about 1000 people, three times a week.

History

Cooper Union was founded by Peter Cooper (1791–1883), builder of "Tom Thumb," the first American locomotive; sponsor, with Cyrus Field, of the laying of the Atlantic cable; and ironmaster who fabricated the iron beam which made possible construction of the skyscraper. He was perhaps the first wealthy man to maintain, and support by action, the tenet that wealth is a trust to be used for the benefit of the public. In starting the school, his purpose was:

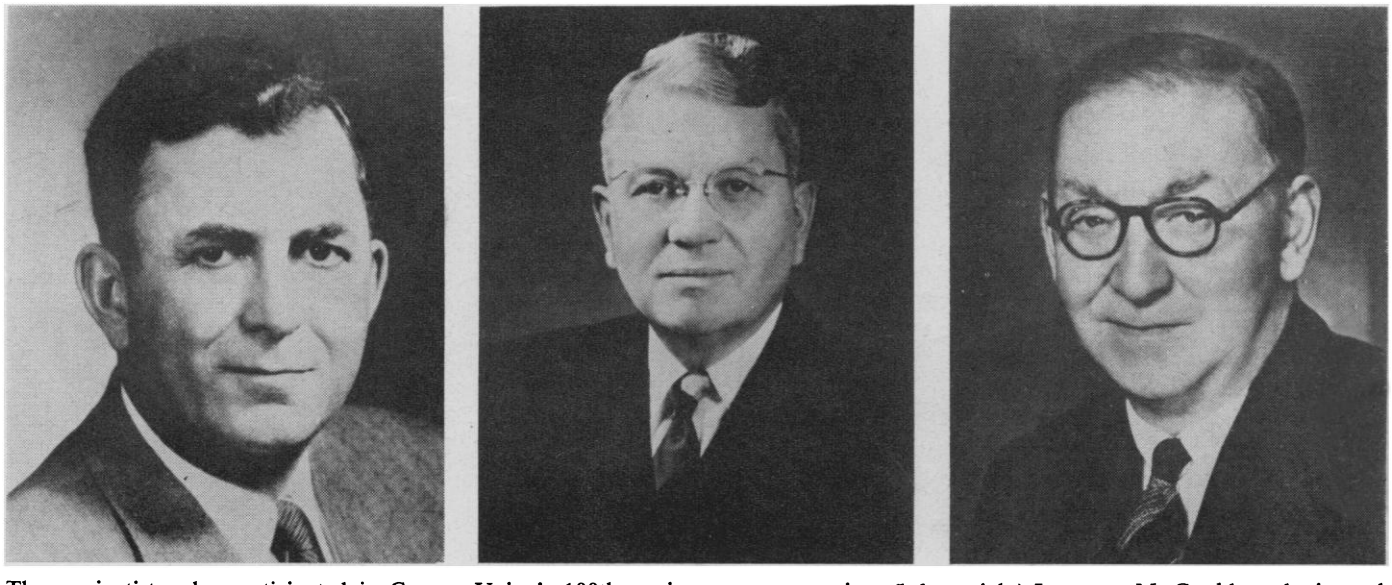
"To provide regular courses of instruction at night free to all who shall attend the same on the application of science to the useful occupations of life, and on such other branches of knowledge as will tend to improve and elevate the working classes of the City of New York.

"To provide and maintain a school for the instruction of respectable females in the arts of design and to afford to respectable females instruction in such other art or trade as will tend to furnish them suitable employment."

When evening classes began on 7 November 1859, 2000 men and women, each armed with a certificate of "good moral character," then the only requirement for entrance, presented themselves for instruction in mathematics, chemistry, mechanical philosophy, architectural drawing, free-hand drawing, and vocal music. Historian Allan Nevins says Cooper Union was the "first great experiment in adult education in this country . . . It was also the first great trade school for women in America."

The contrast between the Cooper Union of 1859 and that of today is spectacular. In 1859 the faculty numbered 20 teachers, as against 160 now. The first annual budget was about $35,000; today's budget is about $1,750,000. A century ago, when a college education was for the few, Cooper Union offered a modest education for the many. Today, with more than 3 million Americans in colleges, Cooper Union's role has changed to that of giving, insofar as it is financially able to do so, the best possible professional education without cost to the selected few who prove themselves best able to use it.

In connection with its centennial observance, which will continue through



Three scientists who participated in Cooper Union's 100th anniversary convocation: (left to right) Laurence M. Gould, geologist and president of Carleton College; Harold Urey, professor-at-large of chemistry at the University of California, La Jolla; and Sir John Cockcroft, physicist member of the United Kingdom Atomic Energy Authority.

the academic year of 1959–60, the Cooper Union has started a development program, of which the first step is the construction of a new building for the School of Engineering. The structure is now well under way and is expected to be occupied during the coming year. Its completion will pave the way for renovation of the present buildings and for expansion of the Art School's curricula to full degree-granting status.

Jodrell Bank Radio Telescope Controlled by Computers

The towering structural splendor of Manchester University's radio telescope at Jodrell Bank, England, which in its first months of operation earned an international reputation in satellite tracking, has to some extent obscured a remarkable electronic engineering achievement—the precise mechanical control of the 2000-ton rotating aerial. To appreciate the extent of this achievement, it is necessary to be aware of the really great size of the Jodrell Bank equipment. The parabolic reflecting bowl, a "dish" of steel plates 250 feet in diameter and weighing nearly 800 tons, can be tilted to any angle to control the elevation of shoot of the aerial. It can even be turned upside down to change the aerial.

The paraboloid is pivoted between two steel towers, each rising 180 feet from a system of deep-trussed girders not unlike railway bridges. All this array of steel is supported on bogies that travel on a circular railway track 352 feet in diameter; these allow the structure to be steered in azimuth. The 2000 tons of hardware can be rotated and the bowl can be rocked to aim the aerial with an accuracy in each coordinate of better than 12 minutes of arc. That figure is the required accuracy, but in fact, in reasonable weather an accuracy of 3 or 4 minutes of arc can be achieved.

Change in Design

Initially it had been planned to make the reflector of wire mesh stretched over a system of tangential supporting members; this would have given a deviation from the true paraboloid of several inches. At short wavelengths—in the region of 1 meter—an error of this magnitude would have resulted in considerable loss of signal, so it was decided to change the design and to form the bowl of individually shaped and welded steel plates. This, of course, made a big difference in the weight and windage of the bowl and necessitated a major redesign of some parts of the structure.

The electronic problem was that of providing a driving system sufficiently powerful to move the telescope in azimuth and elevation under all but the most severe wind conditions and a method of controlling this driving source so that the telescope could automatically follow any point in space, irrespective of the rotation of the earth and its movement round the sun. Two identical closed-loop servomechanisms are used; each must control four variable-speed direct-current motors of 50 horsepower each, operating within a speed range of 10 to 1000 revolutions

Control desk of the Jodrell Bank radio telescope.