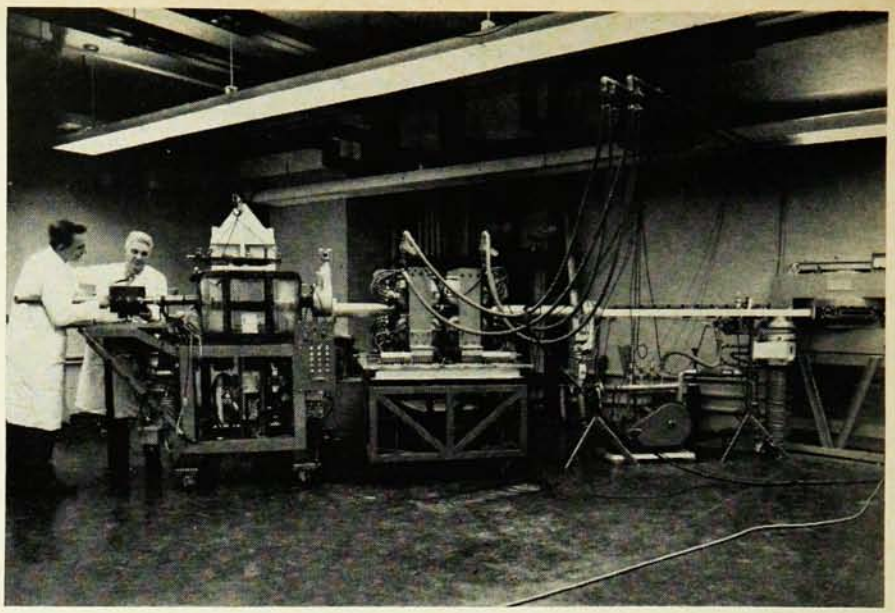
be assigned, even temporarily, to the radio-astronomy service. Other frequency bands which the FCC has allocated exclusively to radio astronomy on a nation-wide basis are:

40.66-40.70 Mc	10680-10700 Mc
73.0 -74.6	15350-15400
1400 -1427	19300-19400
2690 -2700	31300-31500.
4990 -5000	

In addition, other bands have been allocated to radio astronomy on a secondary basis. They include:

2495-2505 kc	14990-15010 kc
4995-5005	19990-20010
9995-10005	24.09-25.01 Mc
	404-406 Mc.



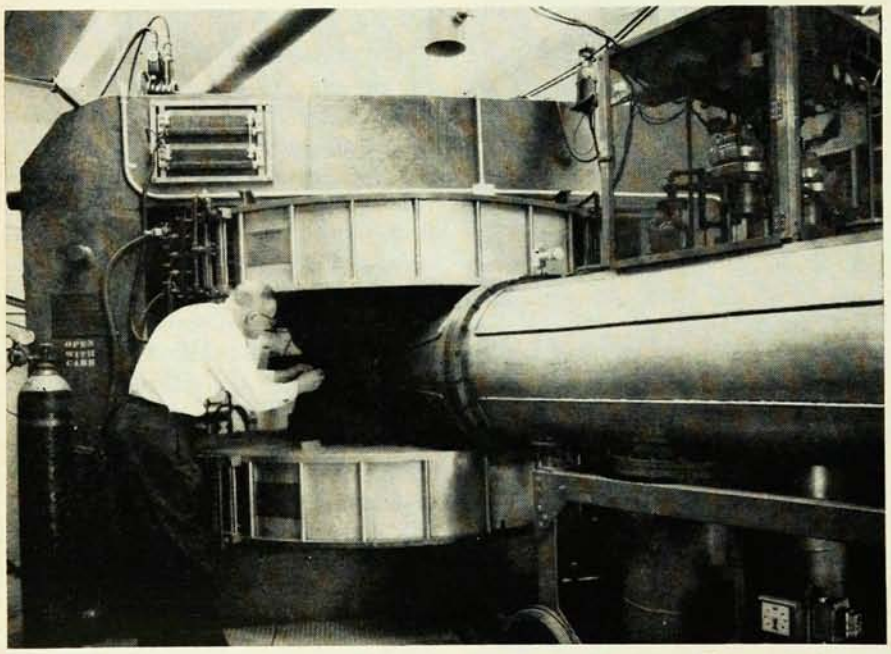
A portion of the experimental area in the new cyclotron building at the Massachusetts Institute of Technology. Scattering chamber is being installed, above, for one of three simultaneous experiments that can be performed with the rebuilt cyclotron.

MIT Cyclotron Improved

A year-long, half-million-dollar program of improvement and reconstruction has renewed and enlarged the capabilities of the cyclotron at the Massachusetts Institute of Technology. When it was designed in 1940, the cyclotron was one of the most powerful and advanced accelerators in the world. The passage of time had rendered it less and less useful, however, and four basic improvements were included in the renewal project: larger target areas, better focusing of the beam, the addition of a modern radiochemistry laboratory, and expanded general research laboratories. To provide the needed space, the entire building, except for the one-story vault around the cyclotron itself, was torn down and a new building, almost five times as large, was erected.

The machine now ranks as a low-energy device. It can produce protons up to 7.5 MeV, deuterons up to 15 MeV, and alpha particles up to 30 MeV and will be useful mainly in studies of nuclear structure and the production of radioisotopes.

Originally designed by a team headed by Robley D. Evans and M. Stanley Livingston, the cyclotron is now part of MIT's Laboratory for Nuclear Science, directed by Peter T. Demos. Funds for the reconstruction included a grant of $333 000 from the US Atomic Energy Commission, with the balance from MIT.



A view of the magnet coils and dee line of MIT's reconstructed cyclotron. Chief operator Earl White is shown adjusting the accelerator's particle deflector.

Monitoring Jupiter

The National Aeronautics and Space Administration's Goddard Space Flight Center has awarded a contract to Yale University to design and develop a world-wide system for monitoring radio emissions from the planet Jupiter. The network will be set up to maintain 24-hour observation of the planet at the frequencies of 16.5 and 22.2 Mc and will consist of four stations, separated from each other by about a quadrant of longitude. One of the stations will be located near the Goddard Center in Greenbelt, Md. The other three will be located at US satellite-tracking stations at Hartesbeesthoek, South Africa; Carnavon, Australia; and South Point, Hawaii.

Since only one of the four stations will have Jupiter in view during a given time period, the others will be free for other studies. A secondary

SCIENTISTS and ENGINEERS

Some facts about Xerox to help you evaluate our capabilities

How good is the Company's potential for growth?

Each year FORTUNE ranks the 500 largest U.S. industrial corporations in order of sales. In 1962 Xerox had the fifth biggest *increase* in sales over the previous year: $104,472,214, up from $61,384,372 (70% higher than 1961). The thirteenth straight year in which a record has been set.

By 1967, Xerox and its affiliated companies should attain world-wide sales and profits three times what they were in 1962. If this objective sounds bold and impractical, let it be said that Xerox has already achieved some of the growth expected in 1964 and 1965. (Nine months figures for 1963 show Net Income up 65.1%).

Indeed, you would not be reading this advertisement if we were not a company determined to reach our goal of continuous growth at a rate averaging not less than 20% a year. Such growth constantly creates key positions in the Xerox organization for scientists and engineers with exceptional ability.

What about R & E?

One of our basic policies is to maintain a creative, strong research, development and engineering organization and program.

By the end of 1962, the rate of research and engineering expenditure had reached the level of $1,000,000 per month. Or approximately 10% of 1962 sales. The company's profit for the entire year 1957 was only $1.6 million.

Five years ago there were 200 people in research and engineering at Xerox. Now there are over 800, and we are vigorously seeking to add to this staff.

Not simply men experienced in the fields of physics, engineering and chemistry. Xerox seeks top-level *creative* scientists . . . men with penetrating minds and a fresh point of view, to unlock doors in the dozens of disciplines in which Xerox is engaged.

To attain these objectives, Xerox grants its engineers and scientists a large measure of academic freedom, encourages them to explore new imaging techniques within the broad discipline of graphic communications. And, in an expanding, campus-like setting, provides the creative climate to help its scientists and engineers keep our various research and development programs on target.

Is the work challenging?

There is literally no end to graphic communications. 47 new patents were awarded to Xerox in 1962 alone.

Xerox scientists and engineers, employing our xerographic and electronic techniques, are today at work on advanced projects in data storage, transmission, retrieval and display systems . . . print-out from analog and digital inputs . . . development of a photographic coating without gelatin for rapid processing . . . a method of forming micro-miniature electronic circuits which incorporate given capacities and resistances . . . equipment which can transmit and record information more than 20 times as fast as conventional facsimile systems.

To be working alongside leading professionals in this rapidly evolving, dynamic field of graphic communications . . . to be given freedom to exercise initiative . . . not only offers opportunity for the highest order of professional fulfillment. It is a challenge of the first magnitude. If you are equal to this continuing challenge, a rewarding and satisfying career can be yours at Xerox.

What's the living like?

Like this. Webster, New York, home of Xerox Corporation's modern, expanding facilities, is a pleasant suburban community situated to the east of Rochester—as are the city's most attractive suburbs. You drive to and from work leisurely, across open country. In a matter of minutes.

Recreational facilities abound here. There are 42 golf courses in the greater Rochester area, a number of them championship courses. From the shores of Lake Ontario on the north to the scenic beauty of the famed Finger Lakes vacationland area to the south, opportunities for skiing, skating, swimming, boating, summer cottage living, weekend outings, and wholesome family fun are unmatched.

Secondary schools in Rochester and its suburbs are among the finest in the nation. Rochester is proud of its reputation as an academic community. And so is Xerox; in 1963 a contribution of $380,000 was made in support of higher education. It is the intention of Xerox to donate annually a fixed percentage of profit before taxes to privately supported colleges and universities.

Is this the life for you?

That depends. On your life goals. And whether you can reasonably expect to achieve them in your present job and location. And how soon.

You may wish to read this page aloud to members of your family. Then take a close look at upstate New York on a map. Then throw the meeting open to discussion. If you agree that it's time for a change in your career . . . time for you and your family to turn over a new life—

MAJOR ASSIGNMENTS ARE OPEN right now at Xerox in the following areas:

Physicists and Physical Chemists
for fundamental studies in materials science, gaseous electronics, electrostatics, and solid state research.

Organic Chemists
for development of novel photoconductive materials and devices.

Paper Chemists
Ph.D., to do exploratory studies in paper technology.

Engineers
B.S. or M.S. in chemical or electrical engineering to work on data storage, transmission, display and retrieval systems.

If your interests and experience qualify you, please send resume and salary history to Mr. Lee B. Sundsted, Xerox Corporation, Dept. PT-1, P.O. Box 1540, Rochester 3, New York. An equal opportunity employer.

function of the system will be to monitor solar emissions and to correlate them with the Jovian data to determine how the sun affects Jupiter's radio activity. At times when neither Jupiter nor the sun is in range of observation, the antennas will be pointed at the meridian to make measurements of relative ionospheric opacity.

Maintenance and operation of the monitoring stations will be the responsibility of the Goddard Space Flight Center. Robert Stone and Joseph K. Alexander, both of Goddard's Planetary Ionospheres Branch, share technical direction of the network with James N. Douglas, the principal investigator for the Yale Observatory.

Lunar and Planetary Data Center

At the request of the International Astronomical Union, the Lowell Observatory in Flagstaff, Ariz., is planning a facility for lunar and planetary scientific research which will establish for the Western Hemisphere a repository of research material, especially photographs, in this field. Its counterpart for the Eastern Hemisphere is at the Observatoire de Meudon in France.

A grant of $236 520 from the National Aeronautics and Space Administration, which will use the material as design information for future space probes, will provide the Observatory with a building for photographic processing, storage, and research. According to Homer E. Newell, NASA's Director of Space Sciences, the facility will be able to provide, for the first time, comparative studies from world-wide observatories of photographic plates taken of the moon and the planets.

Sacramento Peak Solar Telescope

A new solar telescope and an associated laboratory will be built by the Sacramento Peak Solar Observatory on its grounds in the Sacramento Mountains of New Mexico. Construction is expected to be completed by 1970—in time for the next period of maximum sunspot activity.

Research functions of the laboratory will include study of high-energy proton showers associated with sunspot activity and of solar phenomena associated with weather and with communication and detection systems.

Based on a design by Richard Dunn of the Air Force Cambridge Research Laboratory, the telescope will be 328 feet long, of which 200 feet will be below ground. The exposed part will consist of a truncated conical tower and laboratory buildings. A rotating turret for tracking the sun in elevation and azimuth will top the tower. A quartz window with a 30-inch aperture will allow light from the sun to pass through onto flat mirrors in the turret which in turn will direct the light down a 320-foot tube to a spherical mirror at the bottom. The light can then be redirected up to the five observation ports in the above-ground laboratories.

The tube and its complementary instrumentation weighing about 150 to 200 tons will rotate as the sun is tracked, and the entire optical system will be placed in a vacuum to eliminate air turbulence and dust.

Low-Temperature Lab

Low-temperature physicists at the University of Chicago will be concerned with temperature ranges approaching absolute zero in a new $88 000 Ultra-low Temperature Laboratory now under construction as part of the University's Institute for the Study of Metals.

The laboratory, expected to be completed early this spring, will be attached to the Institute's existing Low Temperature Laboratory. It is financed by a $44 000 grant from the National Science Foundation and by the University's Louis Block Fund for Basic Research and Advanced Study.

Twelve of the twenty faculty members of the Institute, ten postdoctoral research associates, and thirty-five graduate students from Chicago's Departments of Physics and Chemistry will work in the new laboratory. Research areas will include investigations of the electronic properties of metals and crystals and the study of Fermi surfaces of metals to determine luster, ductility, and conduction of electricity and heat at extremely low temperatures and under very high magnetic fields. Other studies will be concerned