Brookhaven National Laboratory on Long Island, New York.

When completed in 1984, the National Synchrotron Light Source joined another major center for synchrotron radiation research in the United States, namely, the Stanford Synchrotron Radiation Laboratory at Stanford, California. It was at the Stanford facility where researchers, in collaboration with others from Lawrence Berkeley Laboratory, developed many of the key technical breakthroughs that advanced this technology to its present state of refinement.

Two new facilities are under construction. These are the Advanced Light Source, at Lawrence Berkeley Laboratory, Berkeley, California, and the Advanced Photon Source, at Argonne National Laboratory, Argonne, Illinois. The former is designed to produce light best in that part of the spectrum known as "vacuum ultra violet" and "soft-x-ray." The latter will serve a more energetic part of the spectrum, known as "x-ray" and "hard x-ray."

All four facilities fall under the auspices of Basic Energy Sciences. Through 1987, the two facilities at Brookhaven and Stanford had met the needs of more than 1,350 scientists from 100 universities, 50 private companies, and 15 Government laboratories. More than 90 separate beam lines were operating, some with multiple experimental stations. On average, one-third of the beam lines were used for proprietary purposes by industrial users.

Building on the experiences gained at Basic Energy Sciences facilities, at least one United States computer manufacturer is planning to build its own synchrotron. It will be a limited version, designed not for versatility, but for highly specialized functions in x-ray lithography, a form of fine line etching.

Using x-ray lithography a manufacturer of computer chips can make fine etchings less than a millionth of an inch wide in the surfaces of semiconductors. This capability is believed to be essential for further miniaturization and future competition in this industry. Indicative, perhaps, of their importance in this respect, foreign competitors are slated to build eight or more of these machines. Design experts from Basic Energy Sciences facilities are assisting American manufacturers to compete in this important area of future technology.

As a final example of the tangible contributions this technology is making, a large United States producer of petroleum and petrochemical products recently claimed that its use of synchrotron radiation at Brookhaven had a "major impact" on its research and development of proprietary catalysts. This same firm is continuing to apply this special form of light to solving a host of other problems including: the search for hydrocarbon resources; the development of new materials, from alloys to ceramics; the research in polymer science, surfactants, and microemulsions; and the study of lubrication and wear.

The value of synchrotron radiation as a tool for both research and industrial manufacturing is now well established. Many private, public, and institutional organizations hold a stake in the opportunities made possible by its availability.

In the early 1970's when this consensus was not so broadly shared, Basic Energy Sciences research contributed significantly to the complex process that helped build this consensus and bring to reality the Nation's most important synchrotron light sources. These light sources now serve as a wellspring of invention for a broad array of economically important industries, furthering the United States' technical leadership in many vital areas of international competition.

FAR-INFRARED DETECTORS

What curious observer of the clear night sky has not wondered, "Do planets, like earth, circle the distant stars?" The latest evidence from space, obtained with instruments whose development was aided by Basic Energy Sciences research, suggests that planets, like earth, are possibly quite common.

In 1984, the National Aeronautics and Space Administration of the United States, in collaboration with similar agencies of the United Kingdom and The Netherlands, launched a special satellite-borne telescope. Its purpose was to survey the heavens at special, heat-related wavelengths of invisible light.

The telescope, known as the Infrared Astronomical Satellite, was equipped with instruments so sensitive that they could detect the faint heat of unlit objects in the frigid cold of deep space. In this way, the telescope could "see" the unseeable, such as the cooling remnants of a darkened sun or the