Stony Brook REVIEW

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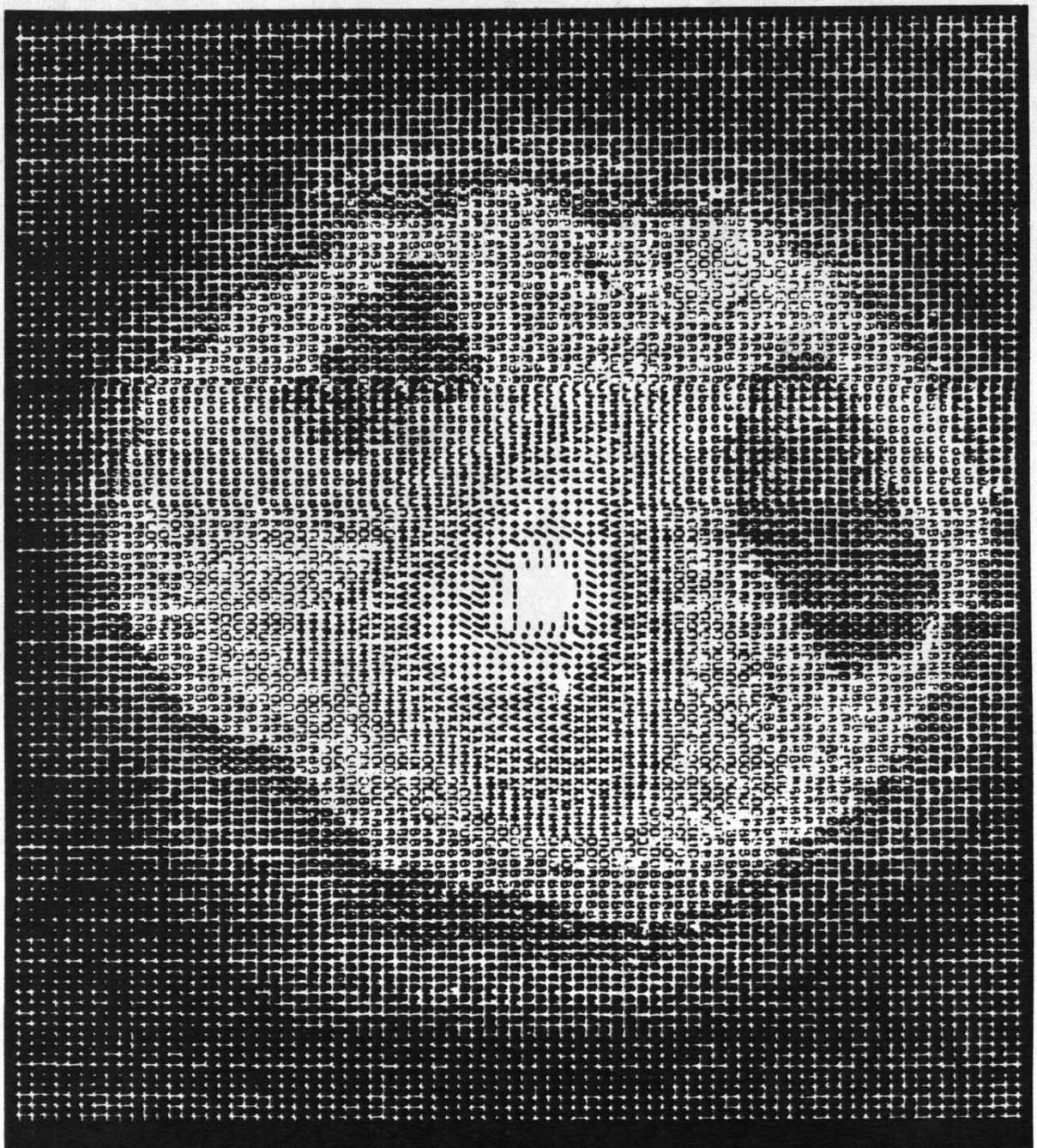


"This is a Mouse?"

(see story inside)

"Yup. A Zeugmatogram of a Mouse."

"A Whaa?"

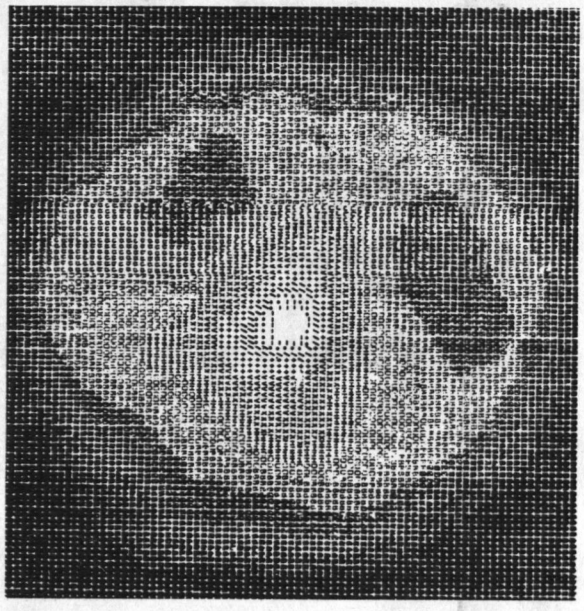
By improving on an old scientific tool called nuclear magnetic resonance (NMR) spectroscopy, a Stony Brook professor of chemistry has developed a way to study the inner structures of objects and to monitor the motions of these structures. Dr. Paul Lauterbur's technique, which he calls zeugmatography, allows scientists for the first time to visualize the soft macroscopic structures and the dynamical changes which occur inside an intact object of study.

Dr. Lauterbur described zeugmatography to the American Chemical Society last April. The technique involves 1) surrounding an object or animal with a uniform magnetic field produced by a large circular magnet, 2) irradiating the animal with certain radio frequencies, and then 3) detecting the radio signals that are re-emitted by the atomic nuclei within an animal's soft tissues, or within an inanimate hard object. Dr. Lauterbur regards his image-forming technique as "the coupling of two fields by the object under study," thus lending itself to the Greek name "zeugmatography" which means "that which joins together."

Magnetic resonance techniques have been used in previous decades for determining properties of atomic nuclei, and for studying the various relationships among nuclei and electrons in atoms, molecules and crystals. Dr. Lauterbur has improved on this technique by extending the view of the object in order to gain additional information about its three-dimensional nature. In addition to this, zeugmatography provides a convenience by permitting photographic resolution of detail much smaller than that theoretically distinguishable with radio waves and microwaves when used in more conventional ways.

The radio waves that shine from an object in an NMR zeugmatography experiment have such long wavelengths that a conventional picture is not possible. But because Lauterbur's technique involves the use of a magnetic field which is not uniform, the radio waves that shine from different regions have slightly different frequencies, and can be tuned in as one might select a broadcasting station. Computer printouts obtained from the radio signals result in picture images in color or black-and-white of the internal structures of the sample being studied. The use of color indicates the differing rates at which different regions of a given sample "glow" and fade away. For example, in some organs of the body the radio glow fades quickly, while in others it fades more slowly.

Although the full practicality of zeugmatography is as yet unknown, for Dr. Lauterbur and his colleagues its uses are far from unconsidered. Dr. Lauterbur points to the possibility, for example, of using his technique to distinguish fatty tissues from aqueous tissue in living organisms.



Newly developed technique by Stony Brook scientist may have far-reaching effects on medical research

Using zeugmatography, noticeable differences between normal tissues and tumored tissues have been detected. Some tumor tissues may thus be detected because they re-emit radio waves slightly later than for other non-tumored tissues. This delay can be represented graphically and perhaps supply diagnosticians with one possible means of detecting tumors in animal or human subjects.

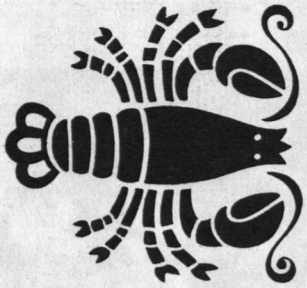
The zeugmatogram on the cover depicts the thoriacic (chest area) region of a live mouse. The lungs may be clearly seen. What is actually seen as light and dark areas can be understood as being a function of the water distribution inside the tissues.

Zeugmatography may someday assume a marked advantage over x-rays. Soft tissues and organs to which x-rays are insensitive are easily observable under the special scrutiny of zeugmatography.

Another likely advantage of zeugmatography is that the magnetic fields and radio waves used by zeugmatography are much less harmful to human patients than are x-rays. If future research affirms this, Lauterbur's NMR technique will play a useful role in complementing both theoretical knowledge and applied medical technology.

If.the study of science can be compared to a map which plots and pictures our knowledge of physical laws and theories about nature, then it is perhaps possible to illustrate in a larger sense the contribution which Dr. Lauterbur has pioneered to further the dimensions of our map. In this vein, zeugmatography can be viewed as a technique which will enhance scientists' capabilities to explore nature on the *inside.* This additional access to viewing inside nature on the macroscopic level may lead to a broadening and sorely needed understanding of interactions and macroscopic processes in nature. This, in turn, may turn up important insights as to relationships and properties about the life process. Zeugmatography should provide a means to transform our presently two-dimensional map of science into a three-dimensional "relief" map.

Cultivating Lobsters in Captivity Could Make Them Plentiful and Cheaper



Have you noticed that lobsters are becoming scarcer and more expensive? Professor Orville W. Terry, research biologist in the University's Marine Sciences Research Center, is out to do something about it.

With the demand for lobsters expected to increase ten fold in five years, and a steadily decreasing catch over the past few years, Dr. Terry has realized the need for an efficient method to raise lobsters for world markets.

His laboratory, which is located in the basement of an old house in a secluded area of Cedar Beach on Long Island's north fork, contains many plastic containers filled with water and tiny lobsters, no bigger than a fingernail.

But cultivating lobsters is not as easy as it may look. In its natural environment, a lobster takes six or seven years to reach maturity. Complicating matters is the tendency of young lobsters to eat each other up.

The long range goal of the research is to make lobster cultivating commercially feasible, so that in years to come the lobsterman will have an alternative to the dwindling natural resources in the sea. The key to successful lobster farming, Dr. Terry said, is to develop a compound lobster food that can be bought economically in bulk and used as needed.

If a food could be developed which would be nutritious and attractive enough to the lobsters, perhaps their cannibalistic habits could be curbed, he explained. Otherwise, the young lobsters may have to be kept apart from each other in some way.

Dr. Terry is hoping to reduce the lobsters' present six-to-seven growing years to two-to-three years. This he feels may be possible by keeping the crustaceans warm during the cold winter months.

Although the researcher's problems at the moment are large ones, someday we may owe the presence of sumptuous lobsters on our plates and palates to the continued efforts of men like Dr. Terry.

The Way It Was

OPEN HOUSE HELD FOR NEW FINE ARTS CENTER

An open house was held this fall to mark the opening of the new Fine Arts Center Phase One. Visitors toured the four-story brick structure and attended special arts programs presented by the students and faculty members in the Theatre Arts, Music and Art Departments.

The building contains classrooms, seminar rooms, offices, an art gallery, painting, graphics, printing and photography studios, a foundry and sculpture studio, numerous individual music studios, ten grand piano studios, three large music rehearsal halls, a recording studio and an electronic music studio complex.

W. AVERELL HARRIMAN COLLEGE FOR URBAN AND POLICY SCIENCES ESTABLISHED AT STONY BROOK

The establishment of the W. Averell Harriman College for Urban and Policy Sciences at Stony Brook was announced this fall at the second annual Awards Dinner of the Stony Brook Foundation. University President John S. Toll described the new Harriman College as "having pathfinder potential in government's efforts to confront many of the most complex problems of present-day society."

The dinner, which was attended by University Chancellor Ernest L. Boyer, Governor Harriman, and Governor Hugh L. Carey, honored Governor Harriman for his distinguished contributions to higher education. Dr. George Vineyard, Director of the Brookhaven National Laboratory, was also presented with the Foundation's Award for Distinguished Service to Higher Education at the dinner.

SAUDIS, RUSSIANS, AND POLES VISIT CAMPUS

Delegations from Saudi Arabia, Poland and the U.S.S.R. have been among this fall's prominent campus visitors. The Saudi Arabians, who are planning to build a university of their own, were interested in the techniques of rapid construction and were particularly impressed with the earth and space sciences building. The Russians were more interested in the lecture center with its rear screen projection and closed circuit television facilities and how the library building was expanded around an existing structure.

Zbigniew Dembowski, Consul General of the People's Republic of Poland, and six representatives from the Polish Mission to the United Nations attended the opening of a Polish Folk Art Exhibit on campus. More than 40 pieces of sculpture carved by Polish peasant craftsmen were on view for a month.

Local students and teachers make use of the Science and Mathematics Teaching Center to develop, test and analyze new curriculum materials.

Local Teachers Discover Campus Science/Math Center

"Those children look awfully young to be studying in the Graduate Physics Building!"

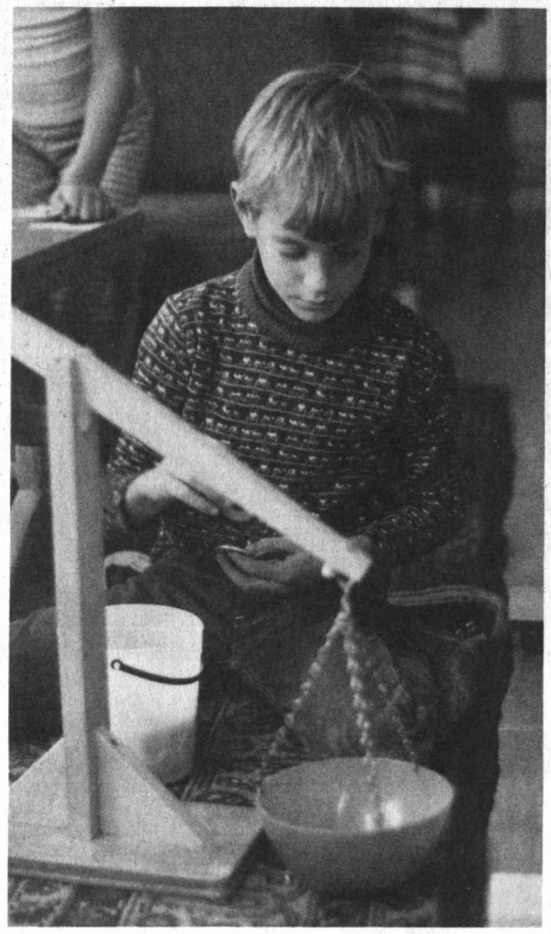
It is easy to understand how a casual observer might have been puzzled last summer by the sight of six junior high school youths participating in a panel discussion in a second-floor laboratory of the University's new Graduate Physics Building. A closer look would have revealed that the young people, together with 35 school science leaders from Suffolk and Nassau counties, were participating in a summer program sponsored by the National Science Foundation designed to improve science education leadership capabilities at the junior and senior high school levels.

This activity was just one of the activities organized by the University's new Science and Mathematics Teaching Center. The Center provides a badly needed facility for research and development to meet the needs of science and mathematics educators in the New York metropolitan area. It occupies a 5,000-square-foot facility and includes elementary school, junior high, and mathematics teaching laboratories, together with a small science and mathematics education periodical library. The Center coordinates its activities closely with smaller laboratories located in other science departments on the campus that house specialized equipment and facilities for many kinds of science instruction.

The Center is the result of several years of planning by university scientists and area science and mathematics teachers associations. These efforts have led to the creation of a facility that has the potential to become a major resource for science and mathematics education in the New York metropolitan area and the northeastern United States. Although the Center is only a year old, it has already received grants from the National Science Foundation and private industry to support a variety of projects enabling local school districts to improve their science and mathematics programs.

The Stony Brook Center appears to be charting new directions for national programs in its attempt to create a research and development facility that can be used by talented teachers and administrators. It hopes to change not just the science and mathematics programs in schools, but the way in which the school district goes about exploiting its own internal capability to develop new and responsive programs. According to Assistant Professor of Physics Lester Paldy, the Center's director, it is probably a mistake for any university or federal funding agency to attempt to impose changes upon reluctant school organizations. Scarce funds are better invested in attempts to stimulate the schools' capacity to innovate, experiment, and choose from among competing alternatives.

It is Mr. Paldy's view that university science departments which, in many parts of the United States, do not choose to interact strongly with schools in their vicinity, constitute an unused resource for public education. He and his Stony Brook co-workers are attempting to make the scientific resources of a major university available to professional educators and citizens in the surrounding region by establishing new organizational linkages. He points out that no single school district is likely to be able to assemble the



mass of curriculum development materials and resource personnel that are critically necessary for a high quality research and development program for science education.

The Center is tackling this problem in a direct way. With the support of grants from federal agencies and corporations, it is assembling a large collection of supplies and equipment that are the stock in trade of any curriculum developer. Once the raw materials and the working space are provided, the challenge then is to organize the human resources, both on and off campus, to tackle local problems effectively. It is essential, according to Mr. Paldy, that the problem-solving process work both ways. University professors can contribute ideas and energy to the solution of school problems, but it is not always recognized that talented teachers, involved citizens, and local science teaching organizations possess resources which can be brought to bear upon problems which confront the university and community at large.

Faculty from many areas of the campus have been working with regional educators. Dr. Thomas Liao of the College of Engineering, for example, used Center facilities to organize a conference sponsored by the Federation for Unified Science Education. In an intensive two-day training session, about 80 persons from school districts in the northeast were introduced to new ways in which school science programs could be coordinated and integrated more effectively. Drs. Kenneth Laser and Elizabeth Mallon of the Department of Cellular and Comparative Biology have been engaged in developing a special teaching laboratory in the new Graduate Biology building while Drs. Robert Schneider and Robert Kerber in the Department of Chemistry have been collaborating with Alice Annar of Bellmore High School and Gary Wouk of Cold Spring Harbor High School to organize a chemistry teaching laboratory in the university's Graduate Chemistry building. These will prove invaluable to university students preparing to teach chemistry at the high school level. Steven Englebright, curator of the Earth and Space Science Department, is constructing a unique museum facility emphasizing Long Island geology and environment that will eventually provide area educators with a site for field trips and educational programs. Dr. Sylva Cohn, associate professor of mathematics, is building a mathematics resource collection and has already organized regional workshops for teachers.

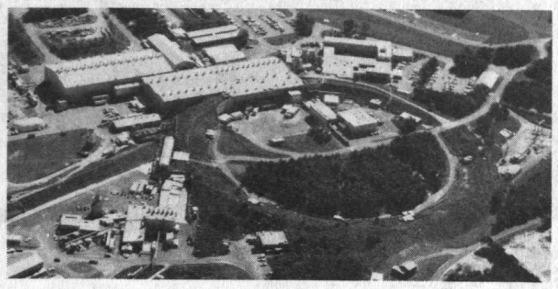
One of the most important characteristics of the Center is its reliance upon significant amounts of volunteer assistance. Persons using the Center are invited to participate in small projects designed to improve the facility for others who will follow as well as for activities designed to improve programs in their own districts. The results of these volunteer efforts are already very visible in the laboratories, where imaginative color schemes are brightening walls that would otherwise be painted in dull institutional colors. As an example of an inexpensive scheme for channeling resources in new ways, Mr. Paldy points to the Visiting Science Teaching Associate program which makes it possible for a teacher or professor from another institution to spend a sabbatical leave at the Center while working on a curriculum development project that will improve the program in his or her district.

Participating teachers utilize the facilities to good advantage and have the opportunity to interact with other persons with shared professional interests. During the summer of 1975, James Lyons of the Hauppauge School District, Curt Hennig of the Northport System, and John Long of Bayport spent two months at the Center working on school district projects while contributing to the development of the Center collection. Mr. Long, for example, is organizing a curriculum resource bank that will assemble information describing locally developed curriculum efforts in Suffolk and Nassau counties. These results will be made available in a systematic way to those who seek ideas and information. This fall, Mrs. Margaret Simon of the Syosset Elementary School System is spending a year at the University while on her sabbatical leave. She is developing a series of modular science materials for use in her district's elementary science program.

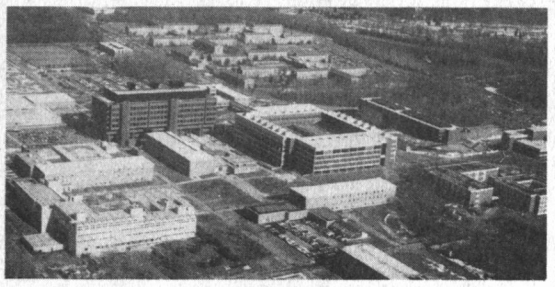
Although it has been long in the making, the Center is off to a promising start. Its reliance upon staff and user-initiative rather than upon massive infusions of state and federal funds suggests that it will prove to be a responsive facility which will continue to develop and provide vitally needed services in a region that has more than its share of environmental, economic, and educational problems. Unlike some programs that the Center director characterizes as "all sail, no anchor," that of the Science and Mathematics Teaching Center promises to be around for the long haul. Persons seeking to participate in or learn about the Center programs are invited to visit or call 246-6592 for additional information.

Thomas Hackney

Stony Brook and Brookhaven Lab Seek to Ease Nation's Energy Problems



Brookhaven National Laboratory



State University of New York at Stony Brook

In collaboration with colleagues at the Brookhaven National Laboratory and elsewhere, Stony Brook scientists are seeking solutions to the energy problems of the region and nation.

A number of departments at Stony Brook are involved in finding new ways to look at the energy dilemma — from projected needs and resources of the 21st century, to the development of new heating and cooling systems for the 1980's.

Within a very short period of time, the research team headed by Dr. Abraham Berlad, professor of engineering at Stony Brook, and Dr. Frank Salzano of Brookhaven may be able to provide considerable fuel savings to home owners in the heating and cooling of their homes. This program involves the study of the efficiency of space heating and cooling systems in relationship to building design. Significant progress is being made with possible implementation within a few years.

Land use is one of the strongest determinants influencing future energy demands. The research of Dr. T. Owen Carroll, associate professor of urban and policy sciences, and Dr. Phillip Palmedo of Brookhaven is directed to the study of alternative energy-conserving land uses. The problem is to conserve the energy consumed by life in urban sprawl. In transportation alone, consider how many people get into a car to drive to work, get back in the car later to drive across town to shop and later that day get in the car again to drive to another area for a party. Drs. Carroll and Palmedo are working on planned community concepts where industrial, commercial and residential activity might be clustered into energy-saving land use patterns.

Long-range planning is the thrust for Dr. Lawrence Bodin, associate professor of urban and policy sciences at Stony Brook, and Brookhaven's Dr. William Marcuse. Their work is in formulating and testing a national energy model which will determine the feasibility of various national energy policies on forecasted energy demands over a 50-year period. Matching assumed energy demands with the technology available now gives them the ability to determine which resources will be used, what technologies will be required and how the technologies and resources will meet the final demand.

The results Bodin and Marcuse are beginning to receive can be utilized to provide factual overall material for future national energy research and development funding. They are currently helping to answer questions such as — should research money go into synthetic fuels such as methane, or into advanced technologies such as fusion or solar energy, what effect will reliance upon imported oil have on the United States and what effect will more efficient engines have on the long-range conservation of energy?

Dr. Franklin Wang, professor of materials science at Stony Brook, is working to meet the federal timetable for solar energy production, which calls for a 220-kilowatt solar energy plant to be built by 1978. His research involves the development of solar cell panels — inexpensive panels made of silicon.

Dr. Wang is taking a less traditional approach. He wants to perfect a workable unit now, sacrificing some efficiency for low initial cost and maintenance. Most research thus far has had little concern with cost and has stressed a high degree of efficiency using materials such as cadmium sulfide. Wang's work intends the use of less costly silicon, in polycrystalline form.

Assisting the faculty on new developments in energy research, and acting as a liaison between industrial organizations and governmental agencies, Paul Lorris has been assigned by the National Science Foundation to serve in the Stony Brook Office of Research Administration.

Dr. Robert Nathans, dean of Stony Brook's new Harriman College for Urban and Policy Sciences has remarked, "The importance of energy research and analysis to our society should be evident to everyone. This is an area where Stony Brook must and can make a particularly important contribution to the future well-being of New York State and the nation."

Stony Brook Helps Catalog World's Art Treasures

Stony Brook has been the center of development for a system of cataloging programs that can be used to index the holdings of museums throughout the world.

With the aid of the Museum Computer Network, Inc., one day it will be possible for a researcher in California to locate specific works of art in New York without even leaving his city by plugging into a "communication network" of widely dispersed computers.

Large museums have always had a problem with the proper upkeep of their files. It was always possible to search for a work of art according to its title or artist, but some collections are so large that it is impossible to find an item under two or more characteristics, unless there happens to be an expert available who knows the holdings of the museum. The MCN, whose national headquarters are in the University's Frank Melville, Jr. Memorial Library, have solved that problem to a very large extent.

The MCN works on the principle that it is impossible to search for cross referenced material if it has to be done by looking through card catalogs or relying on the help of someone who knows the files thoroughly.

"The problem of museums," said David Vance, a visiting associate professor at Stony Brook and president of MCN, "is that although quite a lot of information is associated with each of the millions of objects collected, it has hitherto been impossible to cross reference all this information."

As an example, he cited the case of a researcher who might wish to locate all the landscapes painted in Pennsylvania in the 1890's. "With a large collection, this becomes impossible," he said.

The solution, Mr. Vance said, is to offer the opportunity to museums to computerize all their files and make them logically similar to those of other museums, "using computers for words as well as numbers."

Museums holding MCN membership are able to use a system of computer programs developed by Dr. Jack Heller, professor of computer science at Stony Brook. Dr. Heller was developing "humanities computing" around 1967 when he was approached by Dr. Carl Dauterman of the Metropolitan Museum of Art, New York, in connection with a study of 18th century porcelain. Dr. Heller's contacts with the museum led to a series of meetings of museum executives which culminated in the formation of the MCN in 1967. The availability of his computer system, called GRIPHOS, which stands for General Retrieval and Information Processor for Humanities-Oriented Studies, stimulated the organization of MCN with the objective of exploring computer catalogs. After some experimentation and investigation, the GRIPHOS system was chosen.

Each member museum works with the MCN to discuss the applications of the computer program to the individual museum's requirements.

MCN moved to Stony Brook from its former headquarters at The Museum of Modern Art in New York City in 1974 when a full-time office was needed. At present, MCN has 22 institutional members, of which seven are actually utilizing the computerization process.

For the most part, according to Mr. Vance, the primary goals of the network have been fulfilled in creating a usable program system for the computerization of museum collections. "The next step, which may take eight years," he said, "is to use museum information in a real physical network," that is, to combine the computerized files of the member museums so that each one may have a computer terminal hooked up to a central system.

The goal is not necessarily to join all the 6,000 museums in the United States, but rather to offer all museums an opportunity to index their holdings and share their stored information with others.

Program Assists In Changing Careers

An aerospace engineer is suddenly laid off by a defense firm. A housewife's youngest child is off to college and she is faced with too much time to spare. A college instructor of French is dissatisfied with her job, and a police officer has retired from the force at the age of 40. All these people have one thing in common: they are all looking for a new career and employment at a time when the economy is at a low point.

Dr. Alan D. Entine, Assistant Academic Vice President, has developed a program that attempts to alleviate the needs of these older people who want to start fresh in a new direction.

A couple of years ago, Dr. Entine realized the need for a program that would address itself primarily to the problems faced by this previously ignored population segment—the middle aged worker—and he decided to do something to help.

"There are fundamental changes which are taking place in our society which require adults to have new vocational options at a time in their lives when previous generations gave little thought to such matters," said Dr. Entine, who is an economist—turned—specialist in problems of middle age.

The changes, which have become critical in recent months, include job obsolescence, mid-life personality development, work alienation, early retirement combined with longer life expectancy, and rising career expectations of older women.

Dr. Entine pioneered Stony Brook's Mid Career Counseling Center, which provides guidance and counseling for adults faced with the problems of middle age. Now in its second year, it "gives mature people a chance to receive up-to-date information about education and career options in this region," according to Dr. Entine.

The counseling is run in conjunction with a non-credit course taught by Dr. Entine in the Informal Studies Program of the Center for Continuing and Developing Education. As part of the course, students meet representatives of employer groups as well as receive individual counseling. The cost of the program is $35.

David Thomas, who was dissatisfied with his job, enrolled in the program and has successfully achieved a job transition. Previously a heavy truck merchandising manager and sales engineer, he signed up for the course last fall because "I was to the point where there was more to life than I was experiencing. I thought of going on for a masters degree, but my undergraduate major was history and I found that there was very little around for history majors to do."

Mr. Thomas, 48, is now a technical specialist at Stony Brook's School of Dental Medicine. The program, he said, provided him with assurance that such a change could be made, advice on how to go about looking for a job, and knowledge of the variety of options available to him.

"They took a look at my background," he said. "Often you don't realize the many things that you've done—what your experience really is—that can help you get a job you'd really like." The advice and encouragement he received were accentuated by what he called "one-to-one guidance ."

In further recognition of the problems of the middle-aged worker in today's society, the Center for Continuing Education offered two graduate courses this fall dealing with this subject. One, called "Personality Theories and Assessment," focussed on mid-life and adult development. The other, "The Economics of Human Resources," studied the problems of aging and work in a market economy, and was taught by Dr. Entine.

"We have plans to expand these initial courses into a multidisciplinary program in mid-life assessment," he said. "The proposed program will combine knowledge of various disciplines and cultures, including anthropology, sociology, economics, psychology, and health sciences."

In addition to creating the counseling program and the proposed program in mid-life assessment, Dr. Entine was instrumental in arranging a linkage between the University and the Suffolk County Department of Labor. Stony Brook and the Labor Department entered into agreement to build a Manpower Information System (MIS), which will utilize the University's computer resources and the County's expertise in manpower. Once MIS is operating, prospective employees and available employers will be cross-referenced according to education, skills, experience, and geographic location. The system will make it possible for jobseekers to find out what available jobs fit their qualifications, and likewise, for employers to find job applicants to match job openings.

Dr. Entine has lectured widely on the subjects of aging, work, personality and adult counseling. He is the co-editor, along with Professor Nancy Schlossberg of the University of Maryland, of the upcoming January 1976 issue of *The Counseling Psychologist*, a magazine that will focus on counseling adults and describing the emerging patterns of adult counseling programs in the country. He has been a consultant to the United States Forest Service in Portland, Oregon and the New York Telephone Company.

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