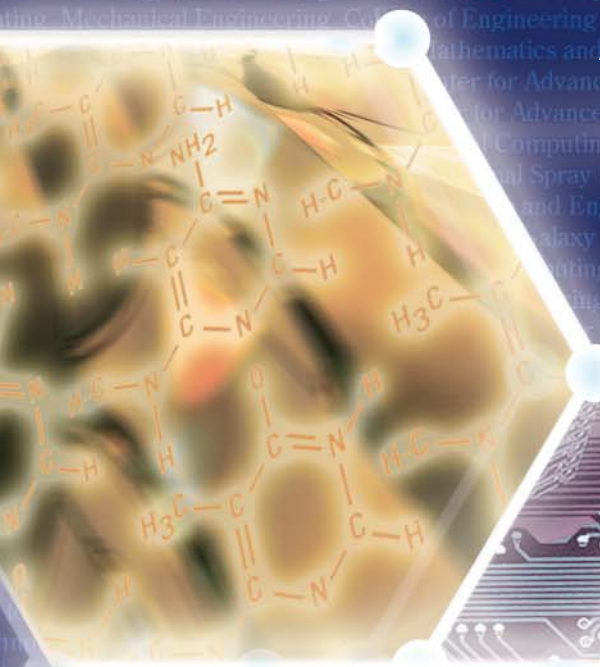
STONY BROOK UNIVERSITY

ENGINEERING 2010



A PLANNING DOCUMENT FOR THE COLLEGE OF ENGINEERING AND APPLIED SCIENCES

STONY BROOK
STATE UNIVERSITY OF NEW YORK

Executive Summary

The College of Engineering and Applied Sciences (CEAS) at Stony Brook University (SBU), is an established and internationally recognized leader in education and research. With its growing and well deserved reputation, it becomes a vital force for the economy of Long Island and New York State. We have plans in place to develop CEAS into a leading national engineering school by 2010. To reach this important goal we emphasize the convergence of technologies:

- biotechnology
- information technology
- nanotechnologies

The CEAS and our region are strong in these technologies. Using them we will serve national needs. Our expertise, in partnership with Long Island industries, will enable us to create a strong competitive position for Long Island as well as for CEAS. All programs and Departments will be valuable contributors to this endeavor. New programs and Departments will be created to help realize these opportunities.

Mobilizing the innovation resources of the recently awarded New York State STAR Center and the newly announced Center for Excellence in Wireless Internet and Information Technology, and leveraging the extraordinary talents and facilities of Brookhaven National Laboratory and Cold Spring Harbor Laboratory, we will build upon our established success in industrial collaboration to develop and commercialize the most promising new technologies. The major components of the plan are to;

- Promote multidisciplinary research through creation of major Centers that focus on convergent technologies. Increase faculty size and graduate programs by 50% and double the annual level of sponsored research to $35M.
- Create new engineering programs in Chemical Engineering, Civil Engineering, Industrial Engineering and Information Systems and strengthen the newly created Biomedical Engineering program. Increase the undergraduate program by 50%.
- Renovate existing facilities and install modern facilities, both computational and experimental.
- Encourage minority and underrepresented groups to enter our programs.

CEAS has the talent and the will to achieve these ambitious goals. We will use the best of our imagination and innovative powers to respond to the rapid change which characterizes today's world. We will be a major contributor to the economic growth of Long Island and New York State and to the technical prowess of our nation.

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CEAS Initiatives

1. 1. New Programs and Departments

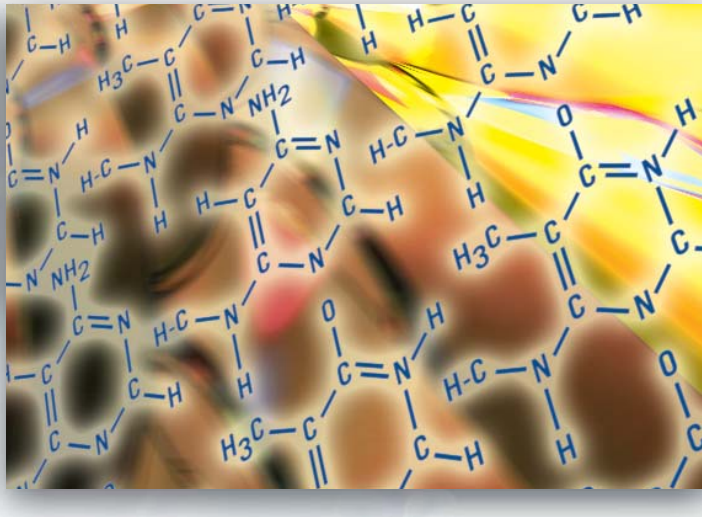
The recent Accreditation Board for Engineering and Technologies (ABET) review panel recommended that the College of Engineering increase the number of program offerings in order to provide its students with a more comprehensive engineering education. Such a move will also bolster the College's national ranking among engineering schools while meeting the increased needs of Long Island industry. In 2000, a Department of Bioengineering was created, and is now seeking ABET accreditation. The College is embarking on the establishment of an ABET-accredited Chemical and Molecular Engineering program. The Engineering 2010 plan also includes the development of an Industrial Engineering program.

1.1.1. Chemical and Molecular Engineering:

The number of high tech, pharmaceutical and specialty chemical industries on Long Island has grown significantly over the past decade. The growth of demand for chemical engineers and the lack of an appropriate Long Island program to fill this need create an opportune moment to start a program in Chemical Engineering at Stony Brook University.

The educational objective of the program is to produce graduates well grounded in the fundamentals of chemical engineering, and in the newly emerging fields in nanotechnology which require molecular level chemical engineering. The program will thus differ from those already in existence. It will emphasize molecular modeling combined with design and application of new nanoscale processes for engineering on the molecular level. While emphasizing traditional chemical engineering skills, the program will teach students the molecular basis of chemical phenomena and operations. This program will stress a strong education in mathematics, physics, chemistry, materials and computer science in combination with courses on patent laws, intellectual property, and ethics.

Our goal is to begin enrollment in the program by 2003 and obtain ABET accreditation by 2007. This very rigorous program will build upon the honors tracks in the physical sciences. The program is therefore designed to prepare students for employment in the chemical, environmental and pharmaceutical industries and for graduate studies in engineering, science, medicine, business, or law. Close relations with Brookhaven National Laboratory and local pharmaceutical industries will provide students with internship opportunities and fellowships.



1.1.2. Industrial Engineering:

Industrial Engineering (IE) is a diverse discipline concerned with the design of integrated systems of people, materials, and equipment for all kinds of manufacturing and service operations. Moving from the traditional emphasis on production systems, we look to a current emphasis on the integration of computers, information, and technology to operate and control complex systems. To address demand for these critically important skills, we propose to create an IE program over the next five years. The program will stress traditional IE topics with emphasis on the use of information technology. It will be the only IE program on Long Island. It will be built on the capabilities of the Departments of Applied Mathematics and Statistics, Mechanical Engineering, and Computer Science. Current undergraduate CEAS courses cover most of the educational components required for an IE program. The IE program would be housed in Applied Mathematics and Statistics, which has a five faculty Operations Research group (OR) offering related courses. With three additional faculty, an IE undergraduate program will be offered which will lead to ABET accreditation within four years of inception. We will leverage existing expertise in AMS and other CEAS departments. The College will develop new undergraduate courses on manufacturing, logistics, and computer simulation. New laboratory courses will be created and associated laboratory space will also be needed.

1.1.3. Information Systems:

A critical shortage of Information Technology (IT) personnel is a challenge facing high-tech companies and financial institutions. Achieving growth of the IT components of these businesses requires IT workers with a strong combination of technical skills and management knowledge. In response to this need, CEAS will create a Department of Information Systems (IS) with special emphasis on the engineering, applications and business aspects of IT. The first stage will be creation of an MS program in IS. The existing undergraduate IS program (currently offered within the Computer Science Department) will then be revised so as to have a strong engineering component. The curriculum will include business-related as well as traditional IT courses. Graduates will possess strong communication and team building skills. The Department will promote an interdisciplinary environment that emphasizes partnership between industry and academia and provides integrated education in IS technologies and applications.

1.2. Multi-disciplinary Research

1.2.1. Wireless Internet:

Governor Pataki announced in April 2001 that Stony Brook University would be home to the new Center of Excellence in the Wireless Internet and Information Technology. The goal of the wireless Internet initiative is to develop the capability for an end user to access any type of information from any geographic location at any time in a secure and user-friendly fashion. Our wireless internet research program will address and solve many of these problems through collaborative research with industry partners such as Computer Associates, Symbol Technologies, Reuters, and other high-tech companies.

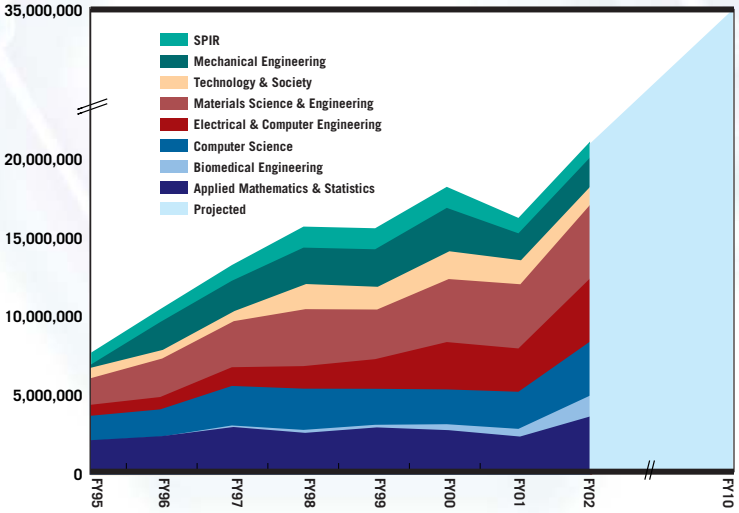
Future wireless internet access devices must be intuitive, ergonomically light, affordable, and easy to use. The devices could be worn or should fit easily into a pocket, yet provide pleasing high resolution images. The devices could feature GPS positioning capabilities. Voice activation, voice processing, and voice-to-text conversion will be natural features of these devices. The devices will operate in an integrated network environment. This environment will feature the coexistence of Wide Area Networks (WANs), Local Area Networks (LANs), and Personal Area Networks (PANs). The mobile user will seamlessly migrate from one network to another. However, realization of this goal is subject to fundamental limitations in terms of power consumption, display space, and interaction modes. The challenge for the wireless internet research programs: to provide mobile, connected computing anywhere in the world within the fixed physical and cost limitations.

In light of recent homeland threats, a reliable, accessible wireless internet infrastructure could provide key communications links in support of several disaster scenarios:

The wireless internet will allow many businesses and individuals not only to operate in a mobile fashion; it will allow them to continue to operate should there be a significant interruption of our aged land-based communication infrastructure.

1

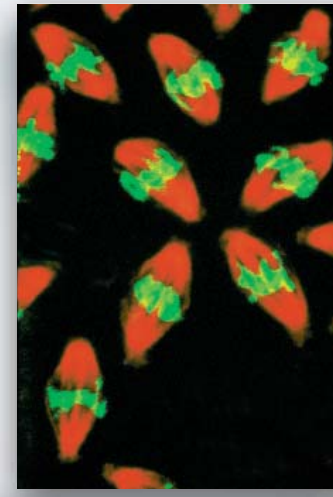
Research Expenditures



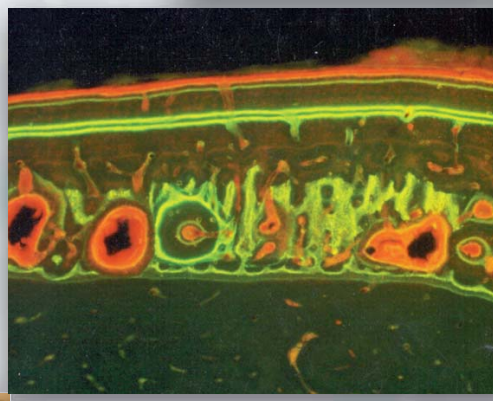
Handheld tools could be developed to increase the efficiency and efficacy of field investigations of bioterror threats. Such tools could provide access to documentation and provide a way to retrieve key facts and information that could be used to correlate events and seemingly unrelated incidents, to develop a pattern for the investigation of the source and introduction of pathogens.

1.2.2. Bioinformatics/Bio-Modeling:

Bioinformatics/Bio-Modeling is an emerging scientific discipline that integrates fundamental principles of biology, mathematics, and computers. It is defined as the systematic application of quantitative or mathematical models, and computational solution techniques, in the analysis of data obtained by biological experiments, modeling, database searches, and instrumentation. Bioinformatics and bio-modeling enable the extraction and analysis of genomic data that can be used in studying the susceptibility to pathogens, and for diagnostics and therapeutics. Genomic data are arriving at an incredible speed from DNA sequences, gene expression data, protein data, and medical genetics data. Therefore, bioinformatic *mining* of data must include design, implementation and integration of biological databases, assembling DNA sequence fragments, creating genomic maps, recognizing and annotating DNA sequence features, phylogenetic comparisons, and predicting RNA secondary structure.



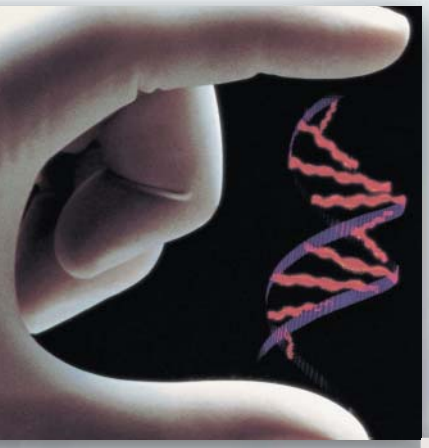
Post genomic structural biology encompasses the questions of protein shape, regions of biochemical activity, and binding rates. Regulation of genes and their expression is an important component of this program. These types of analysis are crucial in research and development leading to commercial drug discovery, improving the design and interpretation of clinical trials, medical diagnostics, and pharmacogenomics. Bioinformatics and Bio-Modeling are becoming important factors in the business sector. More than 50 companies offer such products and services, with a total market that could exceed $2 billion within the next five years. With the unity of computer science, mathematics, and molecular biology becoming increasingly important, training in these integrated areas will prove critical for our students.



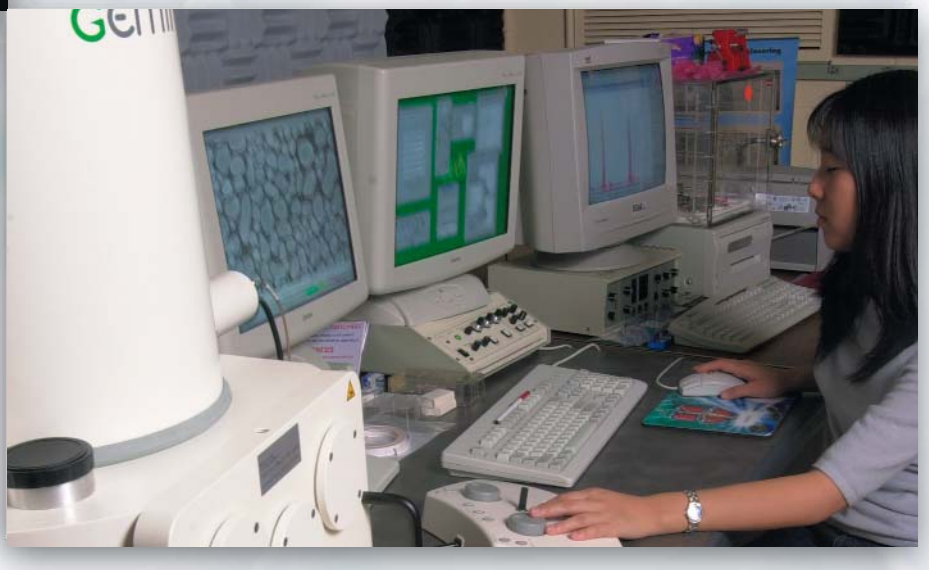
CEAS is developing a curriculum at the graduate and undergraduate levels which will facilitate education and student research in these areas. Given the tremendous strengths in the Departments of Applied Mathematics and Statistics, Computer Science, and Biomedical Engineering, working in close collaboration with the School of Medicine, Cold Spring Harbor Laboratory, the Long Island Breast Cancer Center at Stony Brook University, and Brookhaven National Laboratory, CEAS is ideally suited to excel in research and educational programs in Bio-Modeling and Bioinformatics.

1.2.3. Electronic and Photonic Technologies for Sensors:

Sensors are important to modern industrial growth. Most high-tech companies on Long Island are involved with sensors: making them, using them, or selling sensor-based instruments. Stony Brook is the site of the thriving NY State Center for Advanced Technology (CAT) in sensor systems. The Sensor CAT nurtures expertise that supports product development by NY State industry. The CAT works with large established companies and small start-ups. Research-intensive high-risk product development is the crucial area in which the CAT strives to make its impact. The most important contribution of the CAT is sharing and leveraging the risk involved in the development of new high-technology sensor-based products.



Perhaps the most spectacular recent research breakthroughs at the Sensor CAT have been associated with the development of fluorescence sensors for DNA sequencing applications. Development of these instruments has advanced to a stage where 20 working prototypes have been fully assembled and deployed in the Sensor CAT. Currently, in most US institutions with sequencing capability, geneticists are lining up as users of a centralized machine. The Stony Brook instruments let the biologist modify performance in defined ways to fit the required application. A further breakthrough is the development of ultrahigh-throughput sequencing machines, which will be capable of sequencing one human genome per year in a single desktop machine. In addition, the portability and rapid response of the Stony Brook sequencer permit practically instantaneous sequencing of biological pathogens which could assist in more efficient field investigations of bioterror incidents.



1.2.4. Micro- and Nanotechnologies:

In his visionary paper, *There is plenty of room at the bottom,* Dr. Richard Feynman spurred the field of micro-electro mechanical systems (MEMS). The 21st century will witness unparalleled growth in micro- and nanotechnologies and their applications (MEMS, NEMS, bioMEMS, Optical MEMS, nanorobotics, nanobiotechnology, etc). These tech-

nologies, which will continue to revolutionize the design and fabrication of sensors and actuators, are highly interdisciplinary; hence, active collaboration among the CEAS departments is essential to realize this vision.

This initiative will focus on the design and fabrication techniques for building micro/nano sized sensors and actuators with intelligent control, and research on the unique properties and mechanics of small-scale engineering systems. The goal is to implement smart devices/materials with significant characteristics such as small size, low power consumption, high working frequency, and high actuation authority. The integration of new areas such as biotechnology and the use of new fabrication means and materials are also crucial parts of this initiative. Nanotechnology applies the tools and processes of micro/nano fabrication to create devices for nanosystems, such as probing biology.

The teaching initiatives will be aimed at fostering a set of interdisciplinary groups of students who collaborate among themselves to stimulate the interactions among physics, chemistry, materials, biology, and engineering. Industrial collaboration will provide opportunities for practical application design. A microfabrication facility to enable design, fabrication, integration, and packaging of MEMS and nano systems on a single chip is currently under construction and is expected to be operational in 2003.

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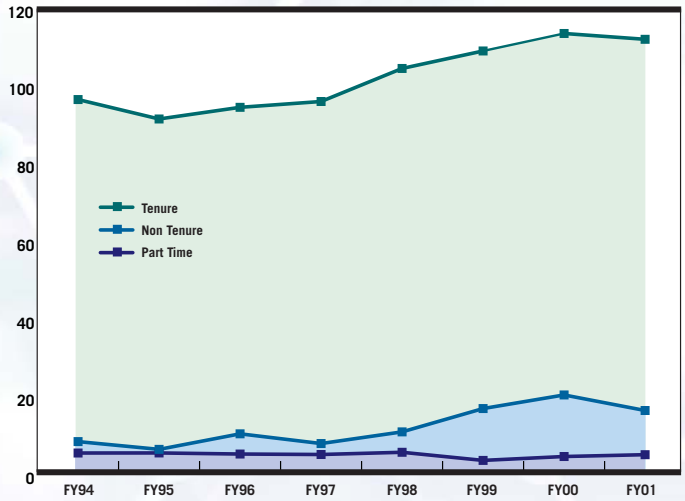
CEAS
FTE Faculty



1.2.5. Rapid and Virtual Prototyping for Manufacturing:

Rapid prototyping (RP) systems can create a desired solid model directly from a CAD file or visual modeling without human intervention. A 3-D model is decomposed into multiple 2-dimensional layers with the use of computer software or visual computing, and a machine will then manufacture the physical part by concatenating layers, one at a time. Since its initial development in the mid 1980's, numerous RP methods have been devised. Some of the more common methods include (1) Stereo Lithography (SLA), (2) Selective Laser Sintering (SLS), (3) Laminated Object Modeling (LOM), and (4) Fused Deposition Modeling (FDM).

The natural connection between the computer model and the physical fabrication of prototypes will result in research initiatives for rapid and visual prototyping. The Departments of Computer Science and Applied Mathematics and Statistics have computing and modeling expertise, as well as visual computing capability, while the engineering departments provide design and fabrication research, technique, and facility. Integration of these two aspects of physical and visual prototyping will facilitate seamless manufacturing automation from design to fabrication. In addition, visual prototyping will facilitate modeling revisions based on computing and simulation, before the final design is sent to fabrication, eliminating expensive and time-consuming iterative processes in making prototypes.

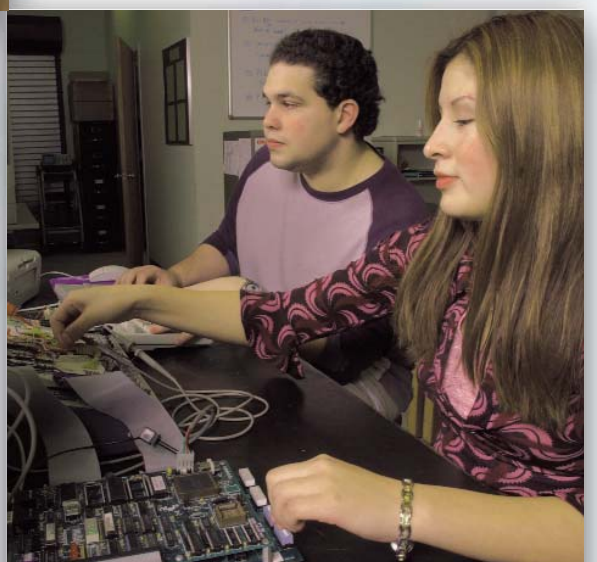
To serve this effort, CEAS has acquired two Rapid Prototyping (RP) machines. These devices permit 3-dimensional printing of complex shapes from digital data. They employ the Fused Deposition Modeling (FDM) and Selective Laser Sintering (SLS) processes. The former is primarily used for course instruction and student projects; the latter for research, instruction, and outreach purposes. The FDM system can make models using various polymers such ABS and biocompatible material, as well as wax, which can then be used in an investment casting process. Interaction with virtual environments, both in terms of visualization and in terms of user-driven design using haptic devices, is part of ongoing research programs in CSE, AMS, and other departments in CEAS.

1.2.6. SPIR and Industrial Outreach:

Now in its seventh year of operation, the SPIR Program (Strategic Partnership for Industrial Resurgence) has had more than 900 projects involving more than 200 participating companies. We now set new goals for collaborations, and new areas of cooperation through increasing SPIR/SBIR/STTR/STP projects, leveraging industrial investment with government funding, increasing incubator activities, and expanding educational development objectives. So that we can collectively respond to the needs of our regional industrial community, we plan to continue to cultivate these relationships, whether they take the form of training programs, educational programs, or product development assistance.

We will achieve our goals for industrial outreach in 2010 by building on our successes to date. We will be expanding our presence in the incubators, including the LIHTI, The Center for emerging Technologies, Farmingdale, Calverton, and the LI BioSciences Park. Activities will focus on training; opening the way for distance learning; producing value-added workshops, such as those recently conducted in conjunction with the New York State Small Business Development Center; and providing technical support and cost sharing on projects and proposals (SBIR/STTR/ATP, etc.), opening up a huge possibility of leveraging industrial funding with federal dollars. We must be prepared to follow companies from the incubators to Accelerators such as the LI Tech Center. Our mature relationship with the Biotech CAT is a model which needs to be more fully followed by the fledgling sensor CAT. There is a great potential which we need to realize for co-funding early stage industrial projects with co-funding of the two New York State CATs that operate under the auspices of our College.

We anticipate stronger ties with Cold Spring Harbor Laboratory, which may join successful SPIR projects with biotechnology companies, especially those with technology potential in gene science.



1.3. Infrastructure and Facilities

1.3.1. The NYSTAR Center for Biomedical Diagnostics:

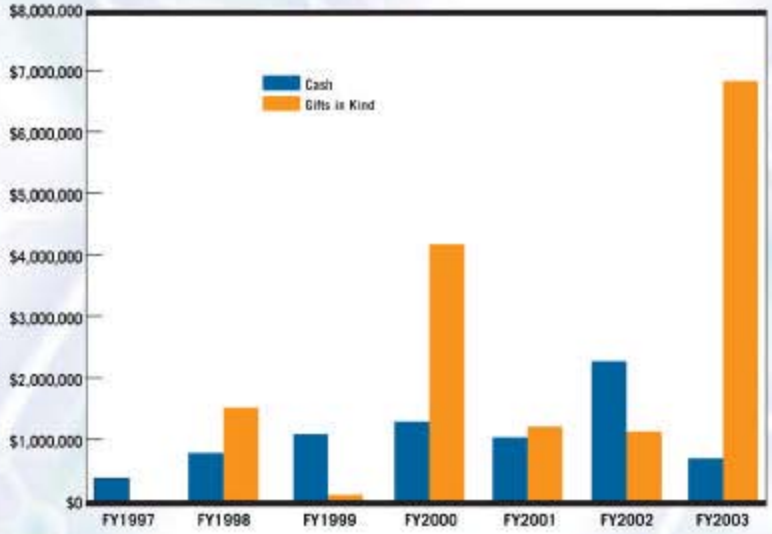
The University is seeking $26 million from private, NYS, and other public sources, to construct a 62,000 sq.ft. building. This facility will house new and expanded research programs in biomedical engineering, medical biotechnology, sensor systems, data-intensive computing, and materials that will constitute the core of the Center for Biotechnology and Bioengineering (CBB) activity. Major support will be provided by the New York State funded STAR Center for Biomolecular Diagnostics and Therapeutics, to be located within this building. Brookhaven's Nanoscale Science Research Center in Functional Materials will greatly extend the capabilities of the STAR Center in areas such as microelectronics, nanoelectronics and nanomaterials.

The Center's goal is to develop faster, more sensitive, and less expensive instrumentation to permit the deciphering of gene and protein expression patterns, leading to the development of new diagnostic and therapeutic strategies. It will serve as the epi-center for research and development in the areas of functional genomics instrumentation, gene discovery, drug design and delivery, and smart micro- and nano-based biomaterials and biosensors. The Center will combine the efforts of engineers and physical scientists developing state of the art instrumentation with those of life scientists relying upon these developments to push forward the frontiers of discovery. It will encourage interaction among Stony Brook faculty, researchers at Brookhaven and Cold Spring Harbor Laboratories, and industry scientists.

The STAR Center will include a two-story drawing tower for the fabrication of optical fibers and clean room facilities, as well as functional genomics and applied sciences laboratories. The facility will also house "larger-than-cell" level biomedical engineering, including biomechanics, to materials testing machines and histomorphometry. Each floor features large, open laboratories, which have immediate access to centralized core facilities.

3

1997-2003: Donations to CEAS



1.3.2. Computer Science Expansion:

We plan to create one of the leading research facilities in information technology (IT), positioned to realize the enormous potential of IT over the next decade. To accommodate the increasing enrollment and expansion of research programs, we are constructing a fully-equipped Computer Science Building of approximately 100,000 sq. ft. The building will house the departments of Computer Science (CS) and Information Systems (IS), and computational sciences programs, including needed expansion for Applied Mathematics computational programs. It will house an Information Technology Incubator and a Center for Excellence in Wireless Internet and Information Technologies. The building will also contain state of the art laboratories, classrooms, and faculty offices and will house the latest in communications and connectivity technology.

1.4. Education Initiatives: Toward a Community of Learners

1.4.1. Improving Teaching and Learning:

University President Shirley Strum Kenny has issued a call to faculty to reduce the role of the traditional lecture format, in which students only passively take notes; all aspects of teaching and learning at Stony Brook should be suffused with the spirit of intellectual inquiry that characterizes a research university. CEAS has been a campus leader in adopting this vision, articulated more fully in the Boyer Commission report, *Reinventing Undergraduate Education: A Blueprint for America's Research Universities.* In addition, CEAS Dean, Yacov Shamash, has demanded increasingly higher standards of teaching. Promotion and tenure files should contain evidence that each faculty member is a creative and innovative instructor as well as a creative researcher. To help meet these higher standards, the College continues to refine its mentoring efforts and its formal and informal support programs to help faculty, support staff and teaching assistants provide better instruction to our students.

An important focus of our educational reform effort is the development of more learner-centered instructional programs. We plan to provide workshops to help faculty and graduate teaching assistants to integrate more active and cooperative learning activities into CEAS courses. We will explore more effective ways of using the Internet via software tools, such as "Blackboard", both to personalize instruction and to promote group discussions. Our students' need to improve their oral and written communication skills will be addressed across the curriculum. Finally, to promote learner-centered instruction, CEAS will collaborate with the Center for Excellence in Learning and Teaching (CELT) on a professional development program for our faculty and teaching assistants.

CEAS is responsive to ABET needs and other professional standards. Our aim is to monitor and improve our instructional programs as suggested by the following:

- Industrial Advisory Boards provide feedback needed to improve educational programs.
- All programs, the Dean's office, and the university have devised comprehensive questionnaires for instructors, students, and employers. This feedback is being assessed to strengthen all instructional programs.
- Web-based responses are being devised to create user friendly feedback methods.

1.4.2. Programs for Underrepresented Groups:

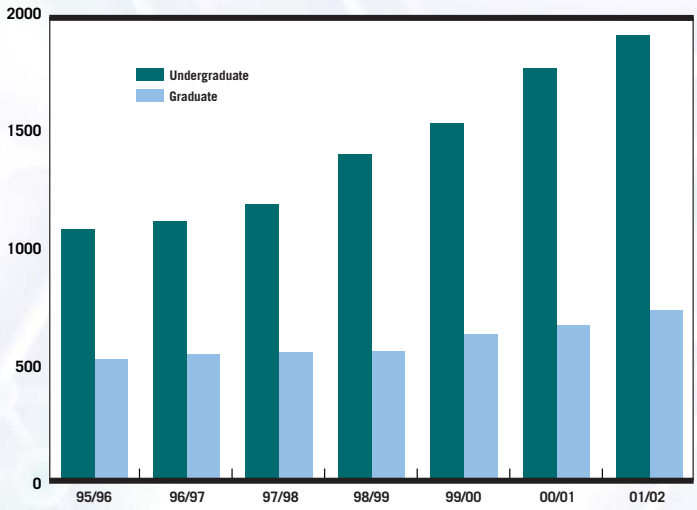
CEAS leads the state and the nation in engaging underrepresented students in science, mathematics, engineering, and technology (SMET) education. Through an array of programs funded by state, federal, and private sources, the College serves underrepresented minority students from middle school to graduate school. The largest of these is a five million dollar NSF Alliance for Minority Participation, led by Stony Brook and involving institutions across New York State. Stony Brook is also the lead institution for the SUNY Alliance for Graduate Education and the Professionals (AGEP) and SUNY Louis Stokes Alliance for Minority Participation (LSAMP) both funded by a National Science Foundation Fund to further minority participation in science, technology, engineering and math education. Stony Brook's Center for Inclusive Education under the direction of Professor David Ferguson serves as a hub for these programs. Professor Ferguson was one of the initial receipients at the White House of the President Award for Science, Mathematics and Engineering Mentoring. In addition there are a number of campus-wide programs supporting greater participation of women and science in education.

The following areas will be the focus for further progress over the next 10 years:

- Better articulation agreements between Stony Brook and community colleges and expansion of model programs to enhance our opportunities to attract minority community college students into our science, engineering, and mathematics programs at Stony Brook.
- Greater outreach efforts to support the early stages of innovative minority recruitment and retention programs.
- Use of structured intervention and research-based retention programs in the mainstream of CEAS.
- Expansion of our outreach to schools so that we involve more schools and establish a continuum of programs from elementary school through high school.

4

CEAS Full-Time Equivalent Students



Departmental Plans

2.1. Applied Mathematics and Statistics

The Department has well-established strengths in computational applied mathematics, statistics, operations research/industrial engineering, and computational geometry. Bioinformatics has become an important new focus of research. Faculty research projects are well funded from diverse public and private sources. Research and innovation in education is a Department strength. AMS faculty are deeply involved in interdisciplinary research and convergent technologies. They collaborate with researchers from a score of different departments on the Stony Brook campus as well as from many other universities, National Laboratories, and industrial partners, large and small. AMS graduates at all levels are in demand for research, educational, and management positions.

2.1.1. Research and Graduate Education

Bioinformatics:
Bioinformatics has a revolutionary impact on the life sciences in areas that extend from fundamental research to current industrial applications. The Department has expertise in multiple areas of bioinformatics: protein modeling, genomics, sequence and microarray expression data, and neuroscience imaging. Two recently hired computational biologists add to our strength in this area. We will develop a new interdisciplinary bioinformatics graduate track jointly with related efforts in Computer Science, Biomedical Engineering, and the Life Science Departments. See Section 1.2.2.

Financial Mathematics:
The demand for sophisticated mathematical modeling and high speed computing in the financial world is unprecedented. Our faculty and graduates are deeply involved in this area. The Department will establish a new Financial Mathematics track combining specialized courses with our present program, already highly relevant to financial mathematics.

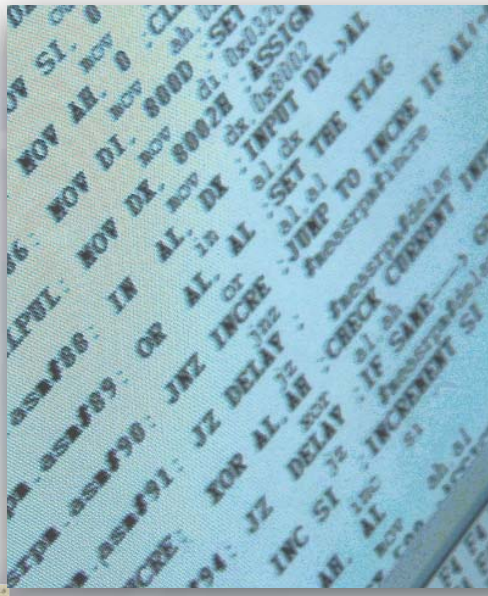
Computational Applied Mathematics:
The Department collaborates closely with Brookhaven National Laboratory. It is a partner in a five National Laboratory – two university consortium to develop easy-to-use mesh and discretization tools as part of a major Department of Energy Computational Science initiative. A major future focus will be the use of supercomputers for the simulation of complex fluid flow and solid modeling. Here we include such topics as cavitation flow in fuel injection systems, free surface magnetohydrodynamics and flow in porous media. We have a vigorous program for the analysis of numerical and modeling errors and their influence on simulation based predictions. These activities include extensive collaboration with National Laboratory and industry.

Operations Research:

The Department has an internationally recognized research program in OR that is well supported by industrial and federal sources, including LI industry. Collaboration with Computer Science, Electrical Engineering, and Sensor CAT faculty is a feature of this program. Current research areas are:

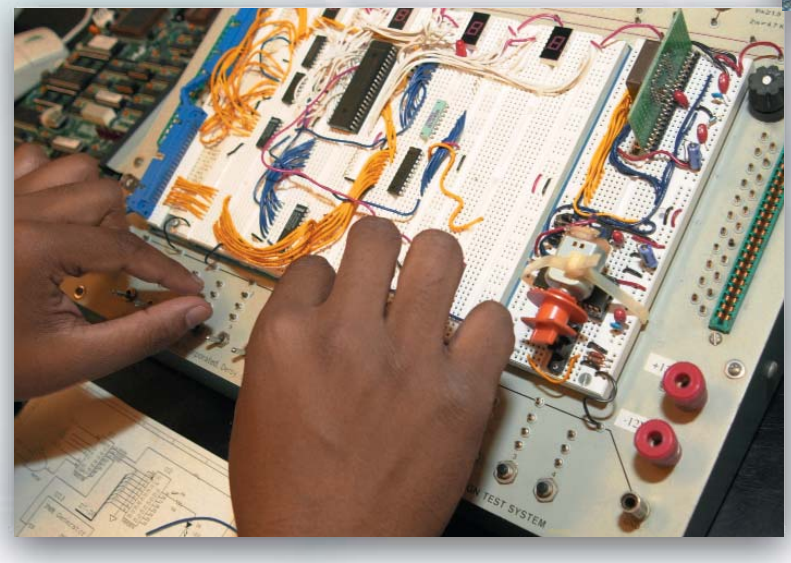
- *Stochastic OR,* including optimization and control, with applications to manufacturing, telecommunication, service, and finance;
- *Computational geometry,* with strong industrial support. We are working with some ten companies, large and small, on diverse projects including NC-machining, air traffic management, robotics, geographic information systems, and pattern recognition;
- *Deterministic OR,* with an emphasis on optimization and computational algorithms.

Future activities will include collaborations with CEAS units in visualization, manufacturing, nanotechnology, CAD/CAM, virtual prototyping, and wireless technology.



Applied Statistics:

Applied statistics presents a major opportunity for Stony Brook. Interdisciplinary research in this area is active and well funded, with primary strengths in biostatistics (analysis of carcinogenic, genetic, and neurophysiological data) and industrial statistics (data mining and prediction). Work in biodetection for national security and environmental concerns will also be featured. The core statistical strengths for this work, time-series, design of experiments, data reduction, spatial statistics, and the analysis of censored data, are also needed for financial, business, and social science applications of statistics. We have a strong role to play in the CEAS convergent technologies thrust.



2.1.2. Undergraduate Education:

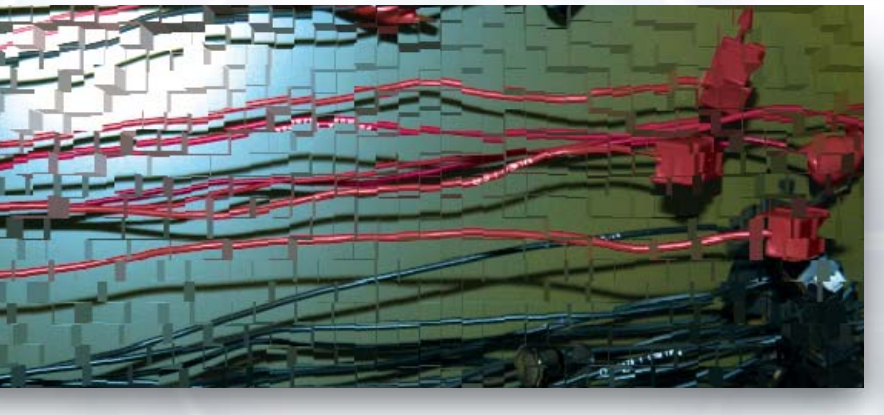
We propose to create over the next five years an ABET accredited program in Industrial Engineering (IE), based within the Department of Applied Mathematics and Statistics and drawing on courses in Mechanical Engineering, Information Systems, and Technology Management. See Section 1.1.2.

Educational innovation is a major strength of the Department. The Department is refining the use of technology in instruction on a number of fronts: PowerPoint presentations in large lectures, building an Internet-based library of digitized lectures of AMS courses, Internet-based homework assignments (generated and graded by software), wireless course assistants, and more. The Department has an outstanding reputation, based on its national leadership and its advocacy of innovative, effective ideas in mathematics education.

2.1.3. Space and Facilities:

Our faculty has doubled, with students and sponsored research up five fold since our original space was assigned. We need, as a minimum, a two fold increase in space to conduct present operations and to participate in the CEAS programs outlined here.

The Department has built its own supercomputer. Continued investment will be needed to maintain this facility. The idea, also advocated by other leading computational science centers, is to use commodity components for the computing elements, the parallel communication network, and the operating system software. The supercomputer is used for physics based simulation modeling, stochastic modeling, biomodeling, and statistical data analysis. The computer and its BNL counterpart are the only supercomputing facilities on Long Island.

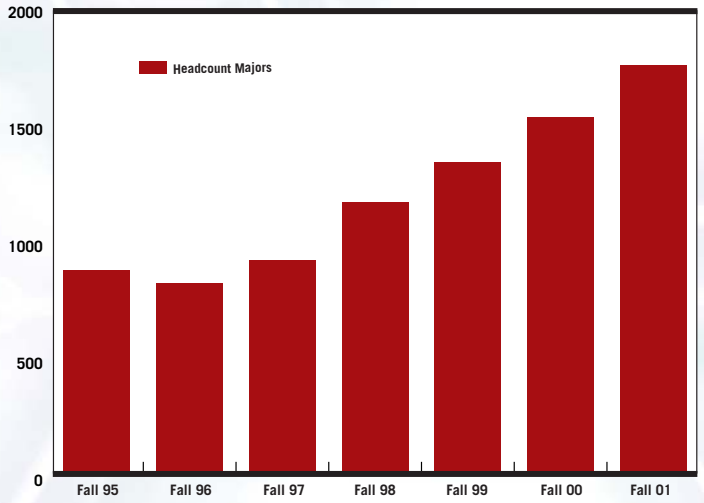


2.2. Biomedical Engineering

Biomedical engineering (BME) integrates the physical, chemical, biological, and mathematical sciences with engineering principles for the study of biomedical systems. Much of our understanding of the complex, system level interactions which control biological processes arises from rigorous interdisciplinary interactions between engineering and biological sciences. Our goal is to cultivate this interaction. We are actively pursuing funds to underwrite construction of a building for biomedical engineering, double the size of our core faculty from eight to sixteen, expand our graduate enrollment to twelve students per year, and achieve ABET approval of an undergraduate degree in bioengineering, with twenty-five students enrolled each year. Further, we hope to expand our research collaborations within Stony Brook University and neighboring institutions. We are very fortunate to have received a multi-million dollar Development Award from the Whitaker Foundation, to help establish new graduate and undergraduate programs in molecular bioengineering.

5

CEAS Enrollment Trend Undergraduate Headcount Majors



2.2.1. Research and Graduate Education:

The newly formed Department of Biomedical Engineering provides a focus for research and educational activities ongoing at Stony Brook within the broad realm of bioengineering and biotechnology. These areas include biomechanics, biomaterials, bioinformatics, biosensors, molecular bioengineering, medical imaging, and tissue engineering. Activities in several of these areas are already well developed. As the Department evolves, we hope to expand into a University leadership position in other disciplines, such as nanotechnology, functional genomics, genetic engineering, and bioinformatics.

Within the last two decades, we have seen tremendous advances in molecular biology and genetic engineering, culminating in the sequencing of the human genome. These advances are paralleled by discoveries in materials (e.g., nanotechnology), electronics (e.g., sensors) and software (e.g., informatics). The convergence of these distinct areas of science and engineering has already spawned entire new branches of biological research. The impact is at the molecular level, and thus we use the general term of Molecular Bioengineering to summarize *the convergence of materials science, electrical engineering, computer science, and molecular biology to deliver, detect, and understand the molecules which define biomedicine.*

The Graduate Program in Biomedical Engineering offers degree programs at the Master's and Doctoral levels. A third option is the Advanced Graduate Certificate program. A class of nineteen arrived in Fall 2001, the majority of whom are domestic students. Through aggressive recruiting, we continue to improve the mean GRE and GPA's of our students. In addition to being offered research opportunities across all divisions of Stony Brook University, our graduate students are participating in medical imaging research at Brookhaven National Laboratory, and bioinformatics research at Cold Spring Harbor Laboratory. We are actively developing internships for graduate students in the growing biosciences industry in New York State.

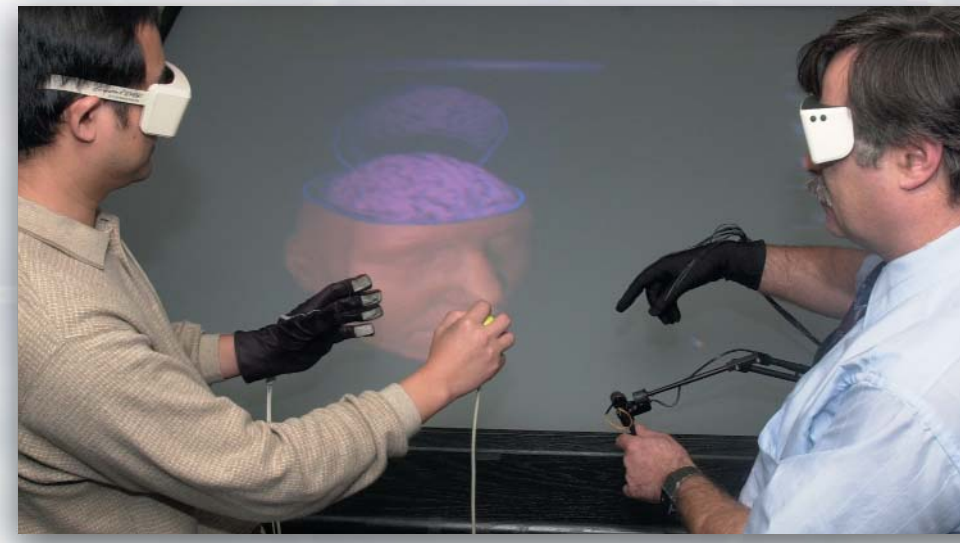
2.2.2. Undergraduate Education:

The Bachelor of Engineering in Bioengineering was approved in Spring 2001, and represents a SUNY first in this discipline. With the first class having entered in the Fall 2001, our goal is to secure ABET approval by spring of 2005. The educational mission is to integrate engineering and biology fully into the curriculum, and offer areas of specialization in molecular bioengineering, biomechanics, biomaterials, and medical imaging. Laboratories, integral to the curriculum, and interactive web-based learning, will be central components of the educational process.

Opportunities for students have grown exponentially with the expanded biomedical engineering ties to the biology, medical, computational, and advanced materials faculty here, at Brookhaven National Laboratory, and Cold Spring Harbor Laboratory. Further, Biomedical Engineering was recently awarded a training grant through the National Institutes of Health (NIH) which provides opportunities for undergraduates concentrating in engineering or hard sciences to work in the biosciences laboratories of NIH funded investigators.

2.2.3. Space and Facilities:

The department seeks to double its space when it moves into the soon-to-be-completed NYSTAR Center of Biomolecular Diagnostics and Therapeutics. The Center will serve as the home for Biomedical Engineering. The Whitaker Foundation is considering a special award to increase the size of this new building.



2.3. Computer Science

The past decade has seen a pervasive spread of computers and applications of the Internet, driving sweeping changes in our lives. The resulting demand for our graduates, at all degree levels, leads us to broaden our programs, well beyond the changes of the past few years. Long Island has changed over the past decade from a defense industry center to an information technology hub. The Long Island Software and Technology Network (LISTNet) has grown to nearly 1,000 companies. Industry giants such as Computer Associates (CA), Reuters Trading Systems, and Symbol Technologies, are headquartered and have substantial development units on Long Island. The Long Island High Technology Incubator (LIHTI) on the Stony Brook campus houses 29 companies, about half related to Information Technologies. The Software Incubator on campus, is a joint venture with CA, houses five start-up software companies.

The Department of Computer Science (CS) is consistently ranked in the top 20th percentile of Ph.D. granting CS Departments. We are the only CS Department to receive three consecutive NSF Institutional Infrastructure grants and one Educational Infrastructure grant. The plan we outline here will create a leading national and international Center of Excellence in Wireless Internet and Information Technologies. It will transform the CS Department into the top 10% nationally. We plan to spin off a new Department of Information Systems (IS), as discussed in Section 1.1.3.

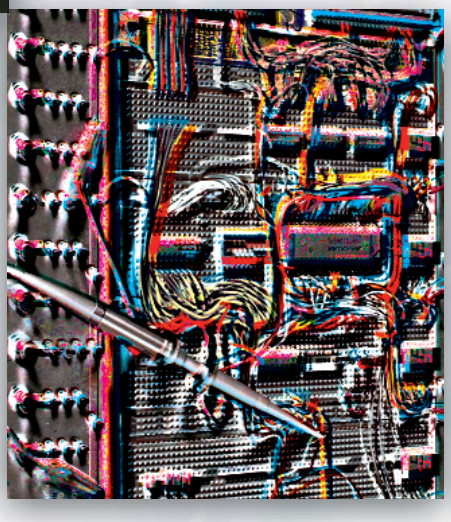
2.3.1. Research and Graduate Education:

The CS Department has world-renowned research groups in visual computing, intelligent databases, verification and concurrency, experimental systems, and algorithms. We plan to maintain critical strength in these areas, with a refocus on three college-wide programs:

- *Wireless Internet* – The focus for this research area is the post-PC generation, specifically the wireless internet: technology, devices, and software used in mobile, handheld, and nomadic information appliances. See Section 1.2.1.
- *Bioinformatics* – This research program will focus primarily on biomedical information systems and computational and algorithmic bioinformatics. See Section 1.2.2.
- *Rapid and Virtual Prototyping* – This research program will focus on the process that can create a desired solid model directly from a CAD file or visual modeling without human intervention. See Section 1.2.5.

In addition to the college-wide programs, we plan to increase the research emphasis in the following areas:

- *Cyber Security* – We have recently established a Center in Cyber Security based on our national leadership and reputation in this area. Networked information systems play an increasingly important role in our infrastructures for critical services such as commerce, banking, and telecommunication. Attacks on networked information systems exploit vulnerabilities that arise either from flaws in the software, from the failure to properly configure such software, or from organizational policy. We plan to develop a comprehensive suite of techniques aimed at proactive, rather than reactive, cybersecurity.
- *Medical Imaging* – This area has emerged as a primary research area for Stony Brook and has received significant support from New York State and LI companies. It requires collaboration among Computer Science, Bioengineering, Applied Mathematics, the School of Medicine, and Brookhaven National Laboratory. It involves technologies for diagnosis and treatment using medical scanning data, such as CT, MRI, Ultrasound, PET, SPECT, and X-rays.
- *Software Systems* – This area includes topics in intelligent database technology, embedded systems, programming productivity, automatic verification, natural user interfaces, reusable code libraries, software engineering, system reliability, performance, transaction processing systems, and software security. Data mining is also a significant topic of interest.

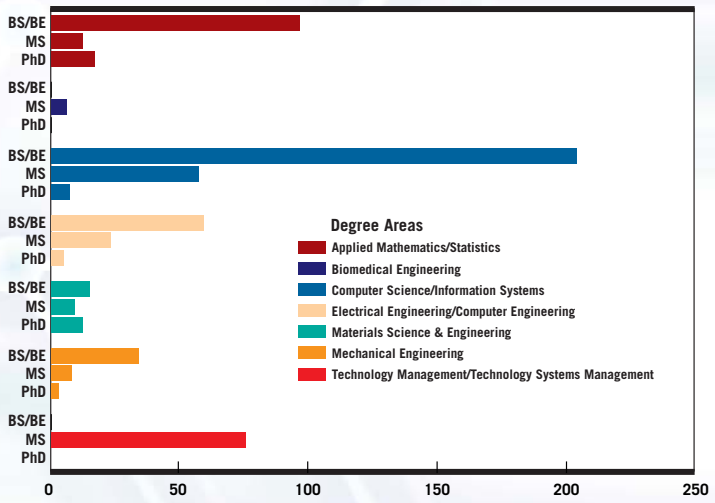


2.3.2. Undergraduate Education:

The recent dramatic increase in the number of students enrolled in the CS/IS programs requires increased faculty size and the introduction of new courses, especially those of interest to local industry. Moreover, we plan to continue to automate course delivery and on-line testing. We have recently doubled the number of graduating seniors with an improvement in their performance capabilities. By 2010, we plan once again to double the number of graduating seniors. The primary vision for the undergraduate program is to:

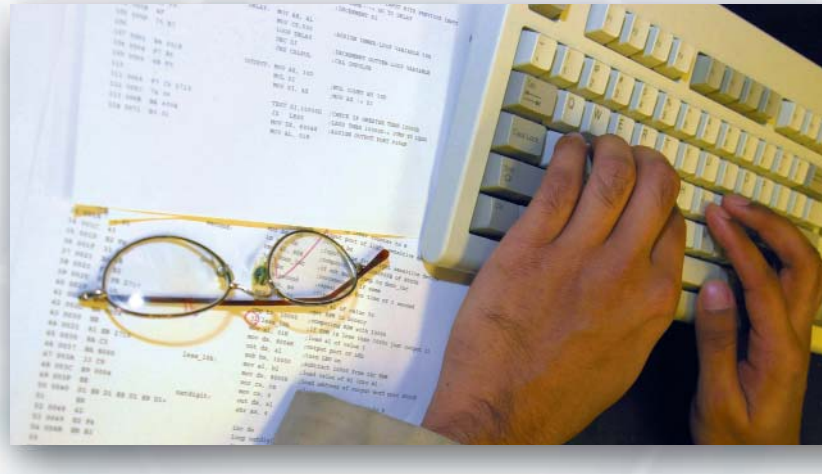
- Accommodate the increasing demand for CS/IS courses while improving the quality of students, their quality-of-life, and the quality of instruction;
- Establish a new honors program in CS;
- Update the curriculum to reflect the changing nature of CS/IS and the needs of local industry for CS/IS graduates; and
- Offer a modified program in IS with an emphasis on the business, engineering, and applications of IT.

CEAS 2000-2001 Degrees Awarded



2.3.3. Space and Facilities:

We plan to establish a Center for Excellence in Wireless Internet and Information Technologies with a mission of research, technology transfer, and education for information technologies, computer science, information systems and applications. We plan to construct a fully-equipped Computer Science Research Building of 100,000 sq. ft. The building will house the Center, the departments of CS and IS, and an IT incubator, as is discussed in Section 1.3.3.



2.4. Electrical and Computer Engineering

2.4.1. Research and Graduate Education:

The recruitment of a large number of high-quality doctoral students is the most important issue for our graduate education; our goal is in the range of 60 to 100 Ph.D. students. Several issues will be addressed in a radical fashion to improve our graduate education.

To finance an incoming class of 15 to 25 Ph.D. students each year, we will seek an expansion of our industrial scholarship base. These funds will be supplemented with SBU resources in the form of TA positions, while faculty research funds will support students in the following years.

We plan to offer graduate degrees in Computer Engineering. There is a great demand among LI engineers for graduate courses in this rapidly changing field. To meet this demand and to serve regional industry, we plan to offer both a graduate certificate and master's degree in computer engineering. We expect a high enrollment.

The Department's important research programs include: optoelectronics, biophotonics, semiconductor devices, VLSI and mixed-signal IC design, advanced parallel systems design and analysis, telecommunications, signal processing, and network theory. The areas of particular research emphasis are:

- *Semiconductor optoelectronics and photonics.* Recently, we established an exceptionally strong nationally recognized group focusing on the innovative design of semiconductor lasers. We shall build on this strength in collaboration with a number of industrial partners.
- *Sensor systems engineering* has been an exceptionally successful area of research in the last several years. This research has led to dramatic technical innovations that offer a many-fold reduction in the cost of DNA sequencing due to reduced reagents consumption and unprecedented parallelism. With generous funding from federal and industrial sources, leveraged by the Sensor CAT, Stony Brook has assembled an exceptional ECE technical team working on the development of DNA instrumentation. Over the next three to five years we see the emergence of a nationally recognized research center at Stony Brook specializing in DNA and protein analysis. The central importance of this scientific field and its inherent ability to spawn major economic growth is proven.
- *Parallel systems* design and analysis research will emphasize ultra-high speed processor design with new non-silicon technologies such as superconductors and parallel architectures for petaflops-scale computing.
- *Telecommunications research* will focus on networking, parallel processing, e-commerce, mobile agents, multicasting communication, quality of service, optical networks, wireless networks, and wireless ATM. Our research in multicast communications will emphasize predictable quality-of-service (guaranteed multicast latency and bandwidth). Optical networks, expected to be the backbone for the next generation of Internet, will be addressed.

2.4.2. Undergraduate Education:

The Electrical and Computer Engineering Department has ABET accredited programs in Electrical and in Computer Engineering. Strengthening both programs, while maintaining their synergy is the central goal of the department. The following issues are of highest priority:

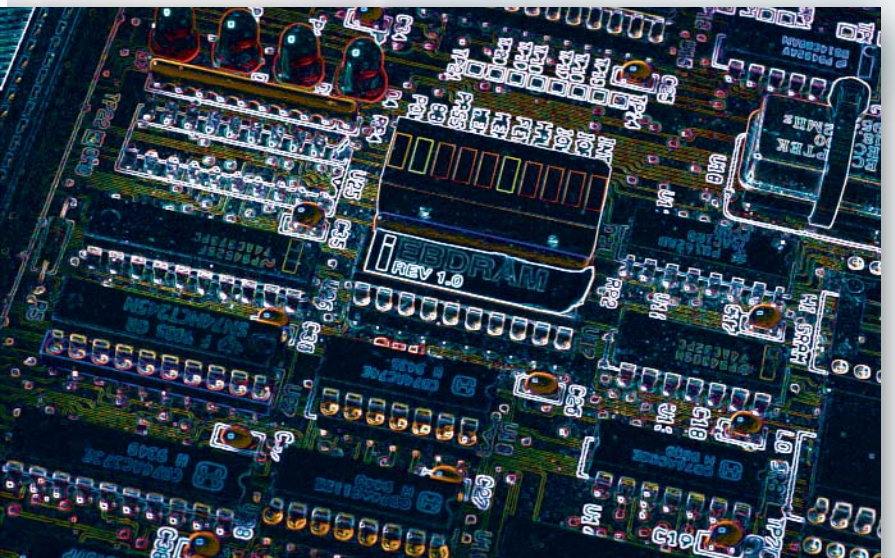
- *Five-year optional undergraduate program* – will be developed to produce master's-level professionals.
- *Strengthening laboratory facilities.* In particular, we plan to establish an electrical shop that enables students to implement and test a prototype of their design using current technology. This shop will include drilling and soldering equipment to manufacture and test printed circuit boards, as well as computers with Data Acquisition hardware.
- *Assessment processes* – will be developed for all aspects of our program. In addition to feedback from students, faculty, and alumni, input from local industry will be solicited.

We will continue the development of a modern curriculum that prepares our students for entry-level positions in industry, with emphasis on the design and implementation of engineering systems and devices. At the same time, our program should strive to stimulate better citizenship through humanistic and ethical studies, and interaction with people in a diverse academic and corporate setting.

2.4.3. Space and Facilities:

Space remains the critical and limiting unresolved issue. Our current facilities are spread over three buildings and for most programs are totally inadequate. It is imperative that each doctoral student has a workplace in the department, including an individual cubicle with a desk and a computer. At present, these minimal conditions for graduate work cannot be provided to all of our existing doctoral students, let alone the desired class of 60 to 100. External reviewers of our department stressed that further development of the research enterprise of our department requires an expansion of space by a factor of three!

We plan construction of the Device Fabrication and Device Growth Facilities, to allow fabrication of semiconductor lasers that operate across a wide spectral range at room temperatures. These laser sources will be important in such areas as free space communication, gas detection devices for environment monitoring, control of manufacturing processes, combustion diagnostics, and numerous medical applications for diagnostics and treatment.



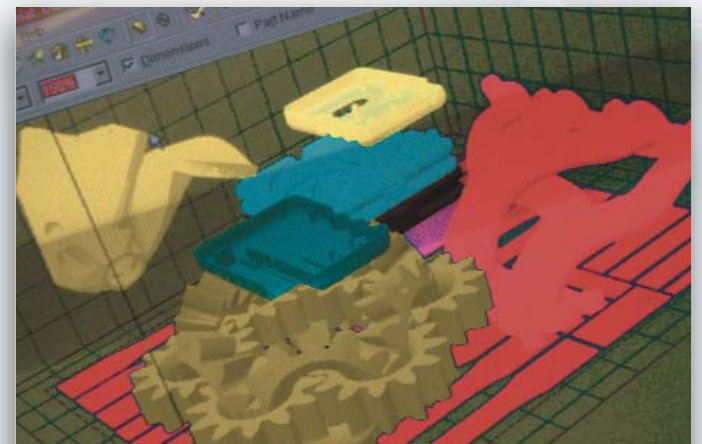
2.5. Materials Science and Engineering

One of our main goals for the next decade will be to raise the NRC ranking of our department into the top ten, a ranking which will accurately reflect our accomplishments in research and education.

2.5.1. Research and Graduate Education:

The quality and depth of our research programs is one of the major strengths of Materials Science and Engineering at Stony Brook. Our two NSF Materials Research Science and Engineering Centers, in polymers and thermal spray technology, were renewed in 2000. We are currently the only institution in the United States with two NSF Materials Research Science and Engineering Centers. Within the past three years we were awarded three NSF Major Research Instrumentation grants (TOF-SIMS, a Center for Crystal Growth, and a new scanning electron microscope). Everyone in the department has a well-funded, major research activity, with programs covering Thermal Spray Science, Polymers, Surface Analysis and Corrosion Science, Magneto-Optic Materials, Growth and Synchrotron Topography Characterization of Single Crystals, and Computer Simulation and Modeling. We run the gamut from industrial based engineering to modeling fundamental processes and advanced materials engineering. The past ten years has seen a shift in the nature of our research effort from single investigator to a more collaborative interdisciplinary type of research. This change reflects the rising complexity of materials research and the emphasis placed by granting agencies on training students to work in interdisciplinary teams. Collaborations, involving joint research and publications, exist between members of our Department and every other CEAS Department. Extensive collaborations, both national and international, also exist with other universities, industry, and national labs.

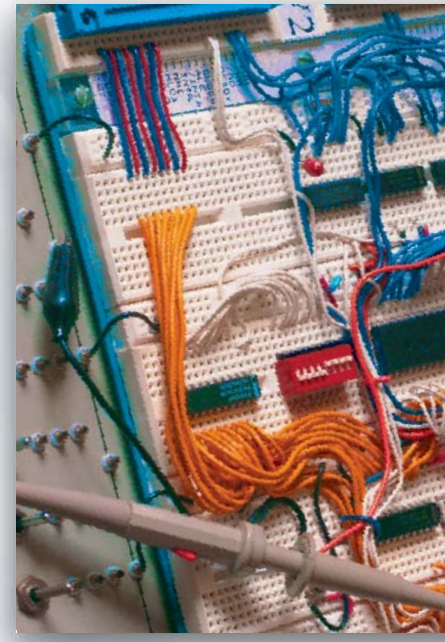
The focus of the research has also shifted from traditional structure/property studies of metals to nanoscale characterization and processing of advanced composite materials. The materials range from non-traditional intermetalics with unique electromagnetic properties and functionally gradient composites for sensor applications, to biomaterials for implants and tissue engineering applications. These shifts have promoted a substantial growth in collaborative research with industry and defense agencies. They place our Department in an excellent position to take full advantage of the recent national Nanotechnology Initiative. In the next decade we will continue to strengthen our team approach with the goal of integrating research on modeling, synthesis, processing, and characterization. We will further sharpen our focus on advanced electronic and magnetic materials, which will involve composite engineering from the nano- to the meso-scale. Finally, we will diversify into the rapidly expanding field of biomaterials and biotechnology.



We plan to recruit additional faculty with expertise in electronic materials processing and crystal growth. We are planning the establishment of a nanofabrication facility (Section 1.3.3.) to serve as a centerpiece for interactions with industry and the new Converging Technologies initiative. Finally, we plan to expand our outside collaborations through the establishment of future consortia such as NSF funded Engineering Research Centers and the DARPA multi-institutional collaboration for mesoscopic device engineering.

Traditionally, students in our graduate program come from physics, chemistry, materials science or engineering backgrounds. The quality of our graduate students is excellent, with four being awarded the *Presidential Award for Distinguished Doctoral Thesis* and one the first recipient of the *Presidential Award for Exceptional Teaching Contributions* given to a student in the Engineering school. In the past eight years our enrollment has increased from approximately 40 to over 65 students.

We expect a steady increase in enrollment in the Ph.D. program as funding increases and new faculty arrive. New courses aimed at teaching students to meet future challenges in interdisciplinary team research are being developed. Special programs in nanoscale engineering, manufacturing, and electronic materials are planned which will be centered on the proposed nanofabrication facility. This integrated research and education approach will be incorporated into a future proposal for graduate education to the NSF-IGERT program. One of the major thrusts over the next ten years will be targeted at our Masters and Continuing Education programs. A new Advanced Certificate Program in the area of Thermal Spray Science represents initial progress in this direction.



2.5.2. Undergraduate Education:

Our faculty give students every opportunity to become involved with current research projects. Undergraduate research is promoted by the existence of NSF-sponsored university undergraduate research opportunities. As a result, approximately 40% of our undergraduates engage in research activities through research courses, fellowships, research internships employment, voluntary participation, research grants or REU supplements to faculty grants. A major new thrust in curriculum revision will be the introduction of a new interdisciplinary program aimed at exposing undergraduates to nanotechnology, manufacturing, and electronic materials. This curriculum will involve courses taught by faculty from various disciplines and laboratory experience within the new nanofabrication facility. The curriculum will lead to industrial internships in the senior year. A major goal for the next ten years is a significant increase in our enrollment.

In order to meet the increasing demand for chemical engineers by the rapidly growing pharmaceutical and cosmetic industry on Long Island, we plan to convert our engineering chemistry program into an accredited chemical engineering degree program. (See Section 2.1.1.)

2.6. Mechanical Engineering

The Mechanical Engineering Department is devoted to teaching and research excellence in thermal fluids, solid mechanics, mechanical design, and manufacturing. The Department has expertise in the areas of thermal process modeling, computational fluid mechanics, fracture mechanics, experimental solid mechanics, mechanical design, manufacturing modeling and control, optical metrology, robotics, micro- and nanotechnologies, and manufacturing automation. Departmental research funding has increased steadily, with faculty in the Department actively involved in state-of-the-art research as well as collaboration with local industries. The Department has internationally recognized expertise and unique experimental facilities in electronics packaging, crystal growth, wafer manufacturing, robotics, and mechanical design. It will be an active participant in the new initiative for micro- and nanotechnologies. Future developments will be focused in the following areas:

2.6.1. Research and Graduate Education

- Micro and Nanotechnologies: intelligent control of transducers (sensors and actuators); application-specific research and development; micro- and nanoscale behavior, such as heat transfer, design, and mechanics; bioMEMS; microfluidics and bio-materials; mechanism based characterization and modeling.
- Next-generation Computer Integrated Engineering and Manufacturing: CIE/CIM; free form manufacturing (or rapid prototyping); robotics, manufacturing automa tion, and control; motion control and planning; metrology as an integral part of manufacturing; optical metrology techniques, such as 3D scanner and moiré measurement of wafer surfaces; and micro- and nanomanufacturing.
- Process Modeling in Thermal Fluids and Energy Systems: natural and forced convection, magneto-hydrodynamics, macro- and microsegregation, thermo-mechanics, melting/solidification, thin films, digital image processing, rapid solidification thermal spray, parallel computing and process animation, advanced combustor design and flow control, advanced turbulence modeling, chemical reacting flows, and crystal growth.
- Energy production: energy-efficient and safe technology for energy production; combustion heat engines; fuel cells; advanced simulation methods utilizing Information Technology (IT) and database, laser-based technologies, interfacial heat transfer, bio-thermal science, and advanced control of microstructure in materials processing.

2.6.2. Undergraduate Education:

The Department will expand its undergraduate program in thermal fluids, mechanics, and design/manufacturing, with an emphasis on innovation and hands on practice. The Department will evaluate the educational objectives and assess outcomes according to the ABET EC-2000 criteria via various mechanisms and methodologies. The evaluation of objectives and assessment of outcomes will provide quality assurance for the curriculum in both thermo fluids and mechanical system tracks. New curriculum initiatives will be sought in emerging areas of micro and nano systems design and manufacturing. The capstone design courses will continue to reflect new curriculum initiatives, industrial projects, and special projects such as design and fabrication of equipment to aid handicapped children.

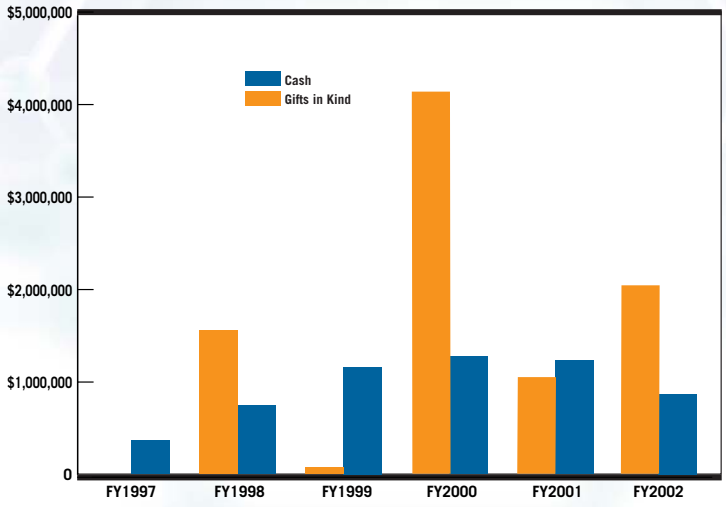
The Mechanical Engineering Department has a dynamic emphasis on hands-on learning, as manifested in student group projects such as the Mini-Baja, the Walking Robot Decathlon, and Solar Splash teams that compete nationally and internationally. The experience gained through such projects complements classroom teaching and encourages students to integrate and apply engineering knowledge with practice. Building upon current success in students' achievements, our vision for the future is to integrate this hands-on approach with the curriculum, and to promote an active synergy involving industrial participants, students and faculty. The research expertise and the resources generated will further aid the development of education and outreach.

The Department will be active in designing interdepartmental programs that incorporate computer-integrated engineering and new interdisciplinary technologies. Such programs integrate the existing activities and course offerings in many CEAS Departments, as well as the SPIR activities. Such cross-disciplinary programs teach mechanical engineering students not only the fundamental theory but also the application of computer-based tools for engineering design and analysis, including the computer-integrated engineering and MEMS technologies.

With the implementation of the Engineering 2010 plan, it is expected that the Department faculty will be increased by 50%; and, through pre-college outreach, the undergraduate enrollment will be increased by 50%-100%; with underrepresented groups increasing by 40% or more. These numbers are consistent with the recommendation of a recent external review of the Department. In conjunction with new interdepartmental programs, the Department anticipates an increase in the number of full and part-time students.

7

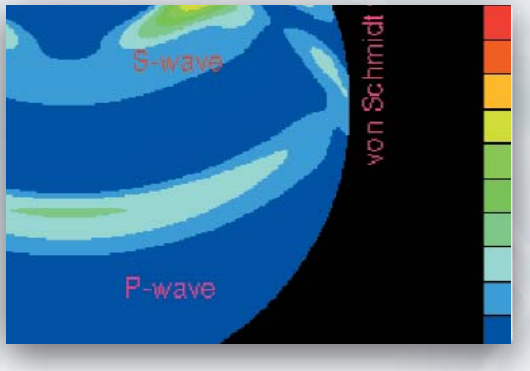
Development 1997-2001: Donations to CEAS



2.7. Technology and Society

The Department of Technology and Society, through its academic programs and sponsored projects, has enhanced the technological literacy and educational opportunities of thousands of students. We have also provided university, regional, and national leadership in educational innovation and STS (Science, Technology and Society) curriculum development. Our courses and curriculum materials are used in many secondary schools and colleges. Our faculty members and professional staff share a common goal of designing and implementing programs to help students of all ages become technologically literate with equal access to educational opportunities. This shared vision translates into instructional and research programs that:

- encourage undergraduate students to explore the design of technological systems and their societal and environmental impacts.
- involve graduate students in educational computing, and environmental and industrial management.
- engage K-12 students and their teachers in the study of how mathematical and scientific concepts are applied to the design of technological systems, and provide effective professional development of teachers in regional K-12 school districts.
- motivate and better prepare minority students to succeed in science, mathematics, and engineering studies.
- focus on the innovative and effective use of information technologies.



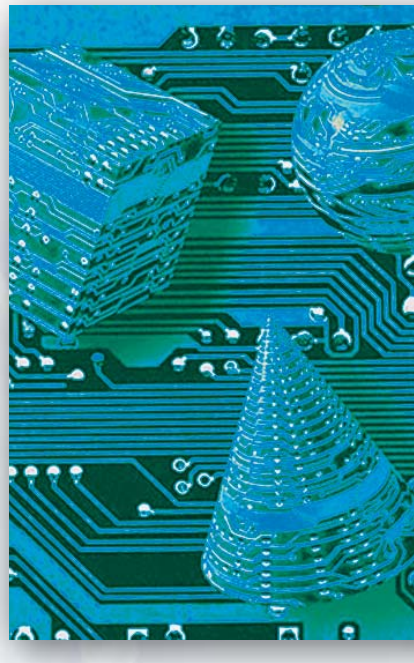
2.7.1 Research and Graduate Education:

New program ideas will extend our core mission of developing technologically literate students and providing equal access to mathematics, science, and engineering studies for underrepresented minority students.

Online Distance Learning

The Laboratory for Information Technology in Education (LITE) was created with funding from Bell-Atlantic. In the past five years, the LITE program, has developed online, web-based versions of six of our graduate courses. During the Spring 2001 semester, DTS became the first SBU Department to offer an online undergraduate course. Five of the full-time DTS faculty members now have experience developing curricula and teaching online. We are positioned to provide leadership to CEAS and SBU in the expansion of web-based distance learning. We are planning to develop and provide systems for providing access to the following graduate programs, totally on-line:

- Advanced Graduate Certificate in Educational Computing
- MS degree in Educational Computing
- International Certificate Programs in Educational Computing



2.7.2 Undergraduate Minor and Major Education:

Technology and Society courses emphasize an understanding of the design of technology and its impact on society. Emerging technological systems and new societal impacts require updating of existing courses and the design of new courses. The demand for our Diversified Education Curriculum (DEC) continues to increase. We will transform at least one existing under-graduate course for on-line offering each semester with a goal of offering the Minor in Technology and Society totally online by September 2003.

The demand for Technology and Society courses among students in Arts and Sciences as well as Engineering has continued to rise. Students who have declared a Minor in Technology and Society have increased dramatically over the past year. Our goal is to continue to market the Minor to business management, social science, and other majors. National trends as well as a needs assessment of the undergraduate students in our courses also indicate a demand for a Major in Technology Studies. The department will update the Major in Technology Studies proposal that was developed two years ago and present it for approval.

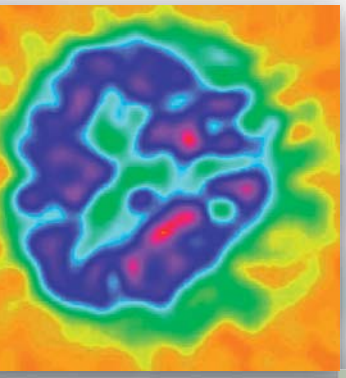
New Programs for Increasing Diversity

The shortage of certified science and mathematics teachers in grades 7-12 is extreme, especially in urban school districts. DTS has a fifteen-year history of helping minority students to succeed in science and mathematics studies in high schools and college programs.

Our STEP (Science, Technology Entry Program) activities motivate and provide academic enrichment and support programs to assist about 200 students to succeed in high school mathematics and science courses. At the college level, via the College-STEP and AMP (Alliance of Minority Programs) programs, we help about 300 undergraduates to excel in science, engineering and mathematics studies. We will recruit and provide special assistance for interested STEP and CSTEP/AMP students who want to prepare for a career as a teacher in secondary schools. DTS will collaborate with the University's Professional Education Program (PEP) Office to design and implement a program to graduate more underrepresented minority students who will be certified to teach science and mathematics in grades 7-12.

The Department has had great success in assisting CEAS and the university to recruit and retain hundreds of underrepresented students. In order to increase the number and quality of incoming students and improve retention of existing students, we will develop new programs that will:

- Result in better articulation agreements between SBU and community colleges and will expand model programs.
- Produce more corporate partnerships for creating more internships and obtaining funding for student recruitment and retention programs.
- Help CEAS Departments to utilize structured intervention models and researched-based retention programs.



On The Cover: (l-r), Molecular Imagery; Engineering Science; Circuit Board; Multimedia Lab; Rapid Prototype Facility (RPF)
Page 4: (l-r), Engineering Science; Molecular Imagery
Page 5: (l-r), Computer Engineering Lab; Circuit Board
Page 7: (l-r), Rapid Prototype Facility; Mitosis in a Syncytial Blastoderm; Low Power Fluorescent Photomicrograph
Page 8: (l-r), DNA; Engineering Science
Page 10: (l-r), Electron Microscope Lab; Rapid Prototype Facility
Page 12: Multimedia Lab
Page 13: Computer Engineering Lab
Page 14: (l-r), Media and Visualization Lab; Mathematical Imagery
Page 15: (l-r), Computer Engineering Lab; Statistical Imagery
Page 16: (l-r), Electronic Imagery; Media and Visualization Lab
Page 18: Media and Visualization Lab
Page 19: Multimedia Lab
Page 20: (l-r), Robotics Lab; Circuit Board; Multimedia Lab
Page 21: Computer Imagery
Page 22: Rapid Prototype Facility
Page 23: Circuit Board
Page 24: (l-r), Computer Engineering Lab; Quinn Lab Representation
Page 25: Computer Engineering Lab
Page 26, 27: SAE Team
Page 28: (l-r), Thermal Spray; Stress Wave Representation
Page 29: Circuit Board
Page 30: (l-r), Cellular Imagery, Computer Engineering Lab
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ENGINEERING 2010

COLLEGE OF ENGINEERING AND APPLIED SCIENCES

2002

STONY BROOK
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