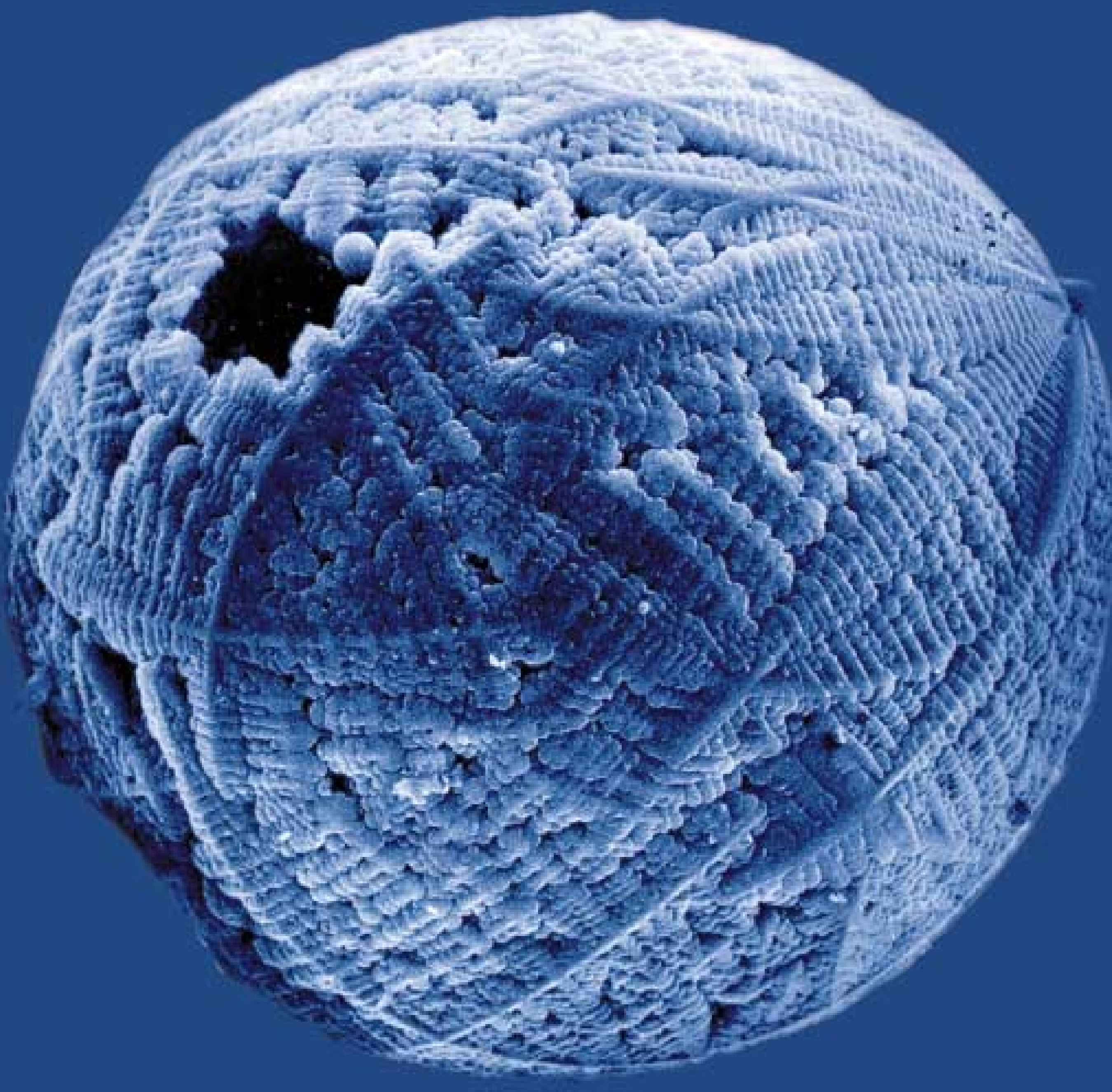
Graduate Studies

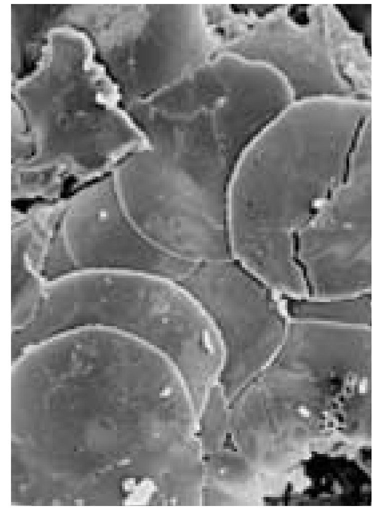
Materials Science and Engineering



STONY BROOK
STATE UNIVERSITY OF NEW YORK

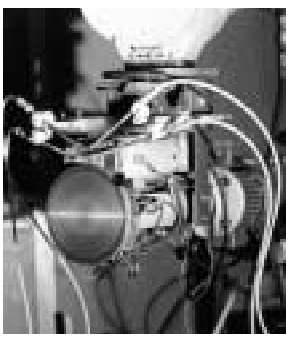
Director's Message

Alex King, Ph.D., Director, Graduate Studies



PROGRAM DESCRIPTION, PAGE 4
The program offers students the opportunity to examine a variety of materials, including this layered "splat" structure of an alumina coating. Each splat is about 50μm in diameter.

Our department offers graduate study leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Materials Science and Engineering. Both programs provide students with a broad and advanced understanding of modern materials science, with an emphasis on the manner in which fundamental science is applied in the design and synthesis of new engineering materials.

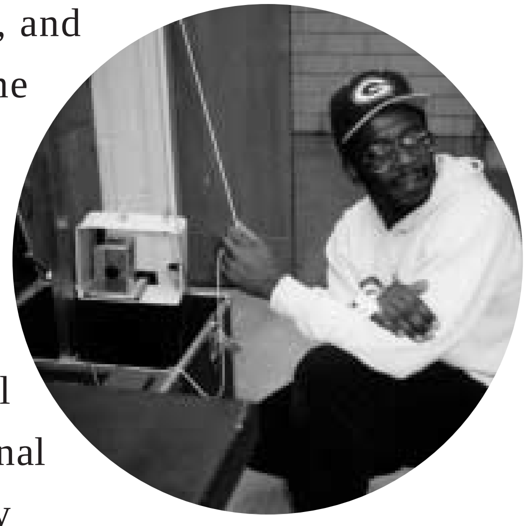


RESEARCH FACILITIES, PAGE 8
This water-stabilized plasma torch, which is used for processing materials, is just one of the many tools students use in the course of their studies.

The program produced its first M.S. in 1969 and its first Ph.D. graduate in 1971. From the start, the program has been an integrated one, rather than growing out of an older program in mining, metallurgy, or ceramics, as have many others. All types of materials are actively studied and researched at Stony Brook, which has the distinction of having two National Science Foundation-funded Materials Research Science and Engineering Centers (MRSECs) housed in a single department — only one other university matches this achievement. In addition, the department houses two major programs in crystal growth, including NASA-funded work on crystal growth in the microgravity environment provided by the Space Shuttle. While the graduate program has achieved distinction in a very broad range of areas, including thermal spray, polymers, crystal growth,

FACULTY PROFILES, PAGE 11
To keep the department on top of the latest innovations, our faculty often meet to share ideas for new research projects.

surface science, thin films, electron microscopy, and X-ray topography, there is still a unifying theme to much of the work done here. Almost all of the research relates in some way to the science and engineering of surfaces or interfaces, and this provides a unique basis for collaborative research, crossing many of the traditional boundaries within the field. Brookhaven National Laboratory is located nearby, and adds many other opportunities for our students to enhance their research experience.



PERSPECTIVES, PAGE 16
Former students discuss their experiences, such as what it is like to operate an experiment in one of the department's many labs.

Our graduate students come from far and wide, and from a range of educational backgrounds that is almost as broad as their geographical diversity. Graduates from the program can be found in all types of technical employment, including universities, national labs, and large and small corporations. In their careers, they move rapidly to positions of high prominence, and we can count a number of full professors, senior managers, research directors, and company vice presidents among our alumni. Stony Brook is at the heart of a range of industry-enabling materials initiatives. We welcome your interest in rising to the challenges with us.

GRADUATE COURSES, PAGE 5
Learning how to view the growth and structural concurrence across an interface is just one of the things students can discover.

Program Description

Electron microscopy is used to obtain vital microstructural and chemical information.

Because teaching is a powerful means of consolidating knowledge, graduate students are required to engage in progressively independent teaching activities.

All students are required to complete five "core" courses from a menu of more than 15 that cover the basics of materials science and engineering. At least one core course must be taken in each semester, until this requirement has been met. The M.S. and Ph.D. programs share this common core of fundamental coursework, allowing students to transfer between the programs with a minimum of discontinuity.

Elective courses provide in-depth study of specialized areas of the subject. Other course offerings include laboratory classes, special "skills" classes intended to introduce the students to special laboratory techniques, and a colloquium (ESM 697).

Because teaching is a powerful means of consolidating knowledge and an excellent training for the communication skills required of all scientific and engineering professionals today, graduate students in Materials Science and Engineering are required to engage in progressively independent teaching as part of their academic training. Newly admitted students are required to take a short course in Teaching Techniques (ESM 501) as a preparation for their teaching duties. The Practicum in Teaching (ESM 698) is a semester-long experience of teaching at the college level, under faculty supervision, and is a degree requirement.

The First Year

For M.S. and Ph.D. students, the first year of study includes core courses, some elective courses, and other requirements, depending on the program and needs of the students. All graduate students are required to take the colloquium course.

Students in the M.S. research track and the Ph.D. program are required to identify a research advisor by the end of their first Spring semester in the program. To this end, they are required to meet with each faculty member during the year and discuss their research interests. Students in the Ph.D. program are also required to take the Qualifying Examination (a written test intended to assess the extent of their background knowledge) by their first January in the program.

Some foreign students may be required to take remedial English courses, depending upon their mastery of the language. These courses must be successfully completed within the first year.

The Second Year and Beyond

After the first year, graduate students usually have a few formal requirements, such as core courses, etc., to complete. Most of the course load, however, is devoted to research, for which academic credit is granted. Students in the M.S. program begin to write up their theses, while students in the Ph.D. program prepare for the Preliminary Examination, an oral exam intended to assess students' preparedness to undertake original research. Once the Preliminary Exam has been passed, students have no further requirements except the completion and defense of an original dissertation.

Special Opportunities

Although most students enroll in the program on a full-time basis, part-time study is also available. A special track within the M.S. program allows students to complete this degree entirely by coursework, rather than by the usual mixture of coursework and research, including the preparation of a thesis. The "non-thesis" option is particularly appropriate for part-time study. Students may also work toward the completion of their degrees without attending the campus: part-time study toward the M.S. is available through the EngiNet distance-learning program, which delivers lectures via television. Especially well-qualified students who are employed in materials research positions may pursue the Ph.D. through the "Extramural Ph.D. Program," which allows the students, with the permission of their employers, to write a doctoral dissertation based upon their work-related research. Please contact the Graduate Program Director with any questions about off-campus education opportunities.

Graduate Course Offerings

TEACHING TECHNIQUES *ESM 501, FALL*
Introduction to basic pedagogical technique. Discussion of the various phases of teaching, including preparation, classroom technique, student evaluation. Problems and pitfalls and how to avoid them.

SCANNING ELECTRON MICROSCOPY SKILLS *ESM 502, SPRING*
Practical introduction to the operation of scanning electron microscopes (SEM), including energy-dispersive X-ray spectrometers. Required of all students who use the SEM in their research.

ELECTRON DIFFRACTION *ESM 503, SPRING*
A quantitative discussion of electron diffraction as a means of micro-characterization of materials and as a basis for understanding image contrast in the transmission electron microscope. Topics covered include atomic, kinematical, and dynamical scattering; indexing diffraction patterns; and convergent-beam diffraction.

BIOMATERIALS SCIENCE AND ANALYSIS *ESM 504, SPRING*
Course content is directed toward providing a thorough treatment of the engineering issues implicit in understanding living tissue interactions with processed materials. Emphasis on identifying and eliminating surface contamination, corrosion, and optimizing material properties and compatibility.

THERMODYNAMICS OF SOLIDS *ESM 511, FALL*
Current knowledge regarding the thermodynamic properties of condensed phases is discussed. The thermodynamic treatment of ideal, regular, and real solutions is reviewed. Estimation of reaction-free energies and equilibria in condensed phase reactions such as diffusion, exidation, and phase transformations; thermodynamic analysis of phase equilibrium diagrams.

STRUCTURE OF MATERIALS *ESM 512, FALL*
The structure of solids can be studied using X-ray, neutron, and electron diffraction techniques. Topics covered are coherent and incoherent scattering of radiation, structure of crystalline and amorphous solids, stereographic projection and crystal orientation determination, and the concept of reciprocal vector space. Laboratory work in X-ray diffraction is also included.

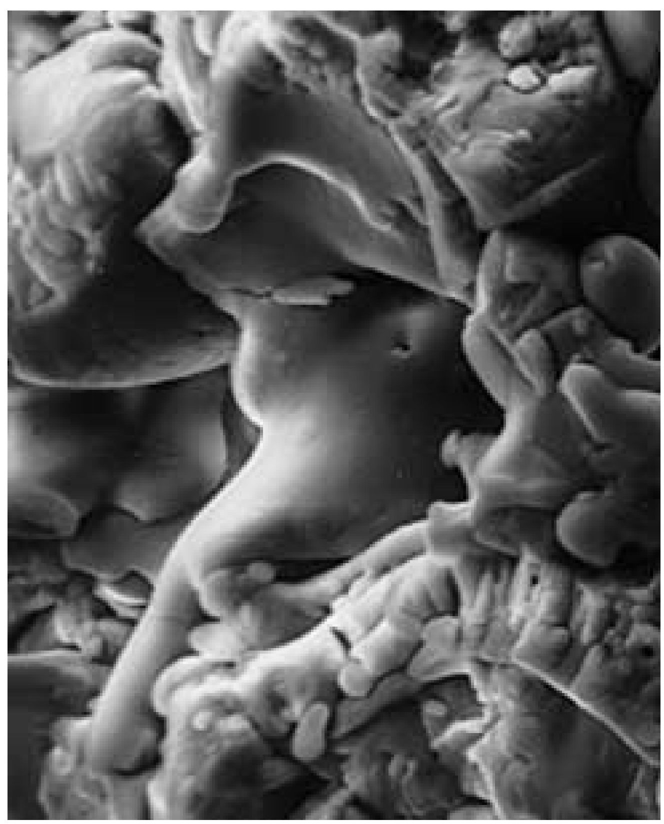
STRENGTH OF MATERIALS *ESM 513, FALL*
A unified approach for all solid materials will be used with regard to the correlation between microstructure and their macroscopic mechanical properties. The course deals with various testing techniques for delineating mechanical properties of materials, considering elasticity, anelasticity, plasticity, dislocation theory, cohesive strength, fracture, and surface wear. Attention is given to strengthening mechanisms for solids, metals, ceramics, and polymers.

KINETICS AND TRANSFORMATIONS I *ESM 521, SPRING*
Atomistic rate processes in solids with emphasis on diffusion in crystals. Theory of diffusion and experimental techniques; role played by a broad class of crystalline imperfections. Topics include annealing of deformed materials, kinetics of defect interactions, thermally controlled deformation, kinetics of nucleation and growth, solidification, and precipitation.

IMPERFECTIONS IN CRYSTALS *ESM 522, SPRING*
The characteristics of point defects in metals, semiconductors, and ionic solids are described, and the thermodynamics of point defects is developed. Dislocation theory is introduced and the structures of internal boundaries are described. Finally, interactions between lattice imperfections are discussed, with emphasis on plasticity and fracture.

SOLID-STATE ELECTRONICS *ESM 523, FALL*
A study of the electronic processes in solids leading to the analysis and design of materials and devices. Crystal structures, binding, electrical and thermal conductivities, diffusion, galvomagnetic, thermomagnetic, and thermoelectric effects. Hall effect and magnetoresistance. Conductivity in thin films.

KINETICS AND TRANSFORMATIONS II *ESM 531, SPRING*
A review of the processes by which structures are changed in the solid state. Classical nucleation theory including homogeneous and heterogeneous mechanisms. Diffusion and diffusionless growth mechanisms. Transformation kinetics.



A micrograph of thermal sprayed coatings of alumina. Some of the microstructural features include unmolten particles, dendrite growth, and columnar structures. (The field of view is approximately 5000 sq.µm.)

Doctoral student Henry White operates the NASA Microgravity Simulator as local high school students look on and learn.

MATERIALS PROCESSING *ESM 532, FALL*
A study of manufacturing processes used in the semiconductor industries. Topics include single crystal growth, compound formation, zone refining, epitaxial growth, doping techniques, thin film techniques, thick film techniques, passivations, isolations, lead bonding techniques, cleaning and etching, and failure analysis; discrete devices and integrated circuit (IC) devices; various modern concepts in IC processing.

POLYMERIC MATERIALS *ESM 533, FALL*
Introduction to the physical properties of polymeric materials. Conformations, phase diagrams, and flow properties of polymers and polymer solutions. Rubber elasticity of polymer networks and melts. Flory-Huggins lattice model for concentrated solutions. Applications to diffusion, segregation, and spinodal decomposition in polymer blends. Experimental methods.

ADVANCED LABORATORY *ESM 534, FALL*
Students perform five advanced materials laboratory experiments, choosing from the following topics: Hall effect in semiconductors, Mossbauer magnetism measurement, High Tc semiconductor characterization, absorption of particle radiation, wetting phases, contact angle measurements, polymer thin film morphology, and adhesion properties of polymer interfaces.

MODERN ELECTRON MICROSCOPY *ESM 542, FALL*
Principles and practice for transmission and scanning transmission electron microscopes. Instrument design. Specimen preparation. Instrument operation. Electron diffraction and imaging theory. Microanalysis using X-ray and electron spectra. Typical electron microscope investigations are outlined and used as examples.

ENGINEERING CERAMICS *ESM 543, SPRING*
The characterization of ceramics is reviewed with special reference to advanced engineering ceramics, bulk high-temperature super-conductors, and ceramic magnets. Typical microstructures and thermal, mechanical, and electrical properties are compared. These properties are related to the various methods of processing.

SEMINAR IN SURFACE SCIENCE *ESM 600, SPRING*
Discussions and reading on current problems in surface physics, chemistry, and crystallography.

SEMINAR IN PLASTICITY AND FRACTURE *ESM 602, FALL*
Intended for advanced students, especially those doing research in the area. Topics: detailed description of defects and their relations to mechanical structure; dislocation theory; plasticity and yield criteria; creep and fatigue; microscopic theory of fracture including ductile and brittle behavior and the relationship of plastic flow to cleavage.

SEMINAR IN ULTRASONIC METHODS AND INTERNAL FRICTION IN SOLIDS *ESM 604, SPRING*
Review of advanced measurement techniques in the field of ultrasonics coupled with quantitative descriptions of experimental variables related to the sample microstructure. Applications to optical, electrical, and mechanical properties are discussed. Use of ultrasonics for nondestructive evaluation is considered.

ADVANCED DIFFRACTION TECHNIQUES *ESM 605, FALL*
Advanced topics in diffraction theory including the dynamical theory in perfect and imperfect crystals and its applications in imaging methods. Other topics from the following list are pursued if time is available: EXAFS/EXELFS/SEXAFS; LEED/RHEED; small-angle scattering; Kossel line and electron channeling patterns; convergent beam diffraction; phonon scattering; glancing incidence X-ray diffraction; diffraction from defect structures; colored symmetry; holography.

SEMINAR IN OPTICAL PROPERTIES OF MATERIALS *ESM 606, FALL*
A survey of modern optical materials and their characterization. The properties of both glasses and crystalline materials are related to physical origin. Electro-optic, elasto-optic, and magneto-optic properties and their interrelations are related to applications in technology including laser systems, displays, and spectroscopy.

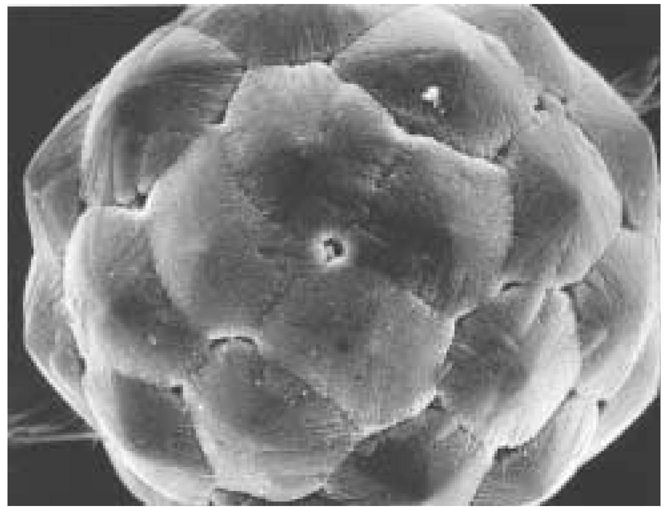
SEMINAR IN CATALYSIS *ESM 608, FALL*
Introduction to homogeneous and heterogeneous catalysis. Geometric factors in catalysis. The kinetics of heterogeneous catalysis. Electronic factors in catalysis: metals, semiconductors, and surface species. Preparation and properties of metal surfaces. Porosity. Typical industrial processes, e.g., Fischer-Tropsch, ammonia synthesis, ammonia oxidation, etc.

SEMINAR IN REACTIONS IN INORGANIC SOLIDS *ESM 610, FALL*
Crystal growth and the nature of defects in inorganic solids. Crystallography and nucleation phenomena in selected inorganic single crystals. Theories of isothermal decomposition kinetics. Measurement of decomposition rates. Radiation effects and nature of radiation damage in inorganic solids. Photodecomposition and the underlying theories of photolysis.

SEMINAR IN ADVANCED THERMODYNAMICS OF SOLIDS
ESM 612, SPRING
The fundamentals of the thermodynamics of irreversible processes and the theory applied to thermal diffusion, thermoelectric transport, and other coupled processes in solids are presented. Thermodynamics of multicomponent phase equilibria. Diffusion, oxidation, and other rate processes in ternary and higher-order systems.

SEMINAR IN MATERIALS AND ENVIRONMENT *ESM 613, SPRING*
Interactions between materials and their environments including corrosion, oxidation, absorption, and adsorption reactions. The influence of these reactions on the properties of materials, the design of materials resistant to these phenomena, alternative methods of protection, and the utilization of these reactions in promoting breakdown and deterioration of materials.


Students and faculty share a special bond. Here Professor Rafailovich joins Dr. Jason Li and his family at graduation prior to his starting a new job at Exxon Research Corporation.


A resolidified alumina particle that demonstrates dendritic growth.

SEMINAR IN DIFFUSION IN SOLIDS *ESM 614, SPRING*
Diffusion in solids is considered in detail, including solution of the transport equations for volume, grain boundary, and surface diffusion. Kirkendall effect and other diffusion phenomena, atomic mechanisms of diffusion, correlation effects, etc. Next, the theory of processes in which diffusion plays an important role is considered, such as ionic conduction, oxidation of metals, and the sintering of solids.

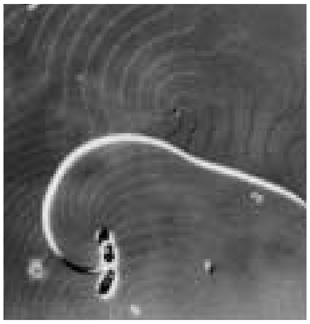
SEMINAR IN PHASE TRANSFORMATIONS *ESM 615, FALL*
The theory of phase transformations in solids is considered. Kinetics and mechanisms of nucleation and growth and martenistic transformations. Melting and solidification, precipitation from solid solution, polymorphic transformations, eutectic and eutectoid reactions, second-order transitions, recrystallization, and other transformations in solids.

SPECIAL PROBLEMS IN MATERIALS SCIENCE *ESM 696*
Supervised reading and discussion of selected publications in particular fields of materials science.

MATERIALS SCIENCE COLLOQUIUM *ESM 697*
A weekly series of lectures and discussions by visitors, local faculty, and students presenting current research results.

PRACTICUM IN TEACHING *ESM 698*
A semester-long experience of teaching at the college level under faculty supervision.

Research Facilities



Spiral-shaped surface steps associated with hollow-cored screw dislocations in hexagonal silicon carbide. This semiconducting material is a candidate for high power, high temperature applications

Research facilities are extensive—on campus and off. Materials Science laboratories and department offices are headquartered in the Engineering Building, with over 30,000 square feet of lab space. Brookhaven National Laboratory (BNL), which Stony Brook now supervises, grants students access to the latest, most advanced equipment available. The department also shares facilities with other local colleges.

Stony Brook's own facilities include state-of-the-art low-energy electron diffraction (LEED), electron microscope, atomic force microscope, and ESCA units, as well as central characterization facilities that include equipment for microanalysis and X-ray techniques. A well-equipped materials fabrication and processing facility within the department boasts a collection of furnaces capable of reaching 3,000°C in controlled atmospheres or under vacuum; a resist-spinner; ellipsometer; contact angle gomiometers; and a high-resolution Nomarsky metallurgical microscope with image processing capability. Analytical electron microscopy is well served by a digitally controlled Philips CM12 scanning transmission electron microscope, complete with EDX and parallel-reading EELS facilities. Other equipment at the facility includes an ISI-SX30 scanning electron microscope equipped with energy dispersive X-ray spectrometer and a Robinson backscatter detector; several ion mills and a Reichert Ultramicrotome for thin sectioning.

Departmental Laboratories

Each lab in the department offers an array of specialized equipment.

The Laboratory for Surface Analysis and Corrosion Science is a state-of-the-art analytical facility containing four electron spectrometers, all having variable angle X-ray Photoelectron Spectroscopy (XPS) capabilities, and two equipped to perform sub-micron spot Auger electron spectroscopy and chemical mapping. An ultra high vacuum fabrication chamber has been configured with two saddle-field icon guns and 1500°C effuser for novel thin fabrication of diamond-like composites, and a variety of intermetallic compounds through Ion Beam Assisted Deposition (IBAD). Static and dynamic Secondary Ion Mass Spectroscopy (SIMS) systems have been recently added to the laboratory. In addition, an *in vacuo* FTIR spectrometer has been acquired as part of a new DOE funded program in radionuclide decontamination of metallic surfaces.

Electrochemical analysis facilities available include several different electrochemical cells, three potentiostats capable of nA range current measurement with PC-based computer control and data acquisition and analysis systems, and electrochemical impedance and noise analysis systems.

The Crystal Growth Laboratory is a facility dedicated to solidification and crystal growth technologies. It includes moderate (<1100°C) and high (<1500°C) temperature Bridgman-Stockbarger furnaces with supporting constant temperature water mixers, programmable power supplies, and computer-controlled experiment, data acquisition, analysis, and display. A three-zone furnace for high purity alloy synthesis, casting, and directional solidification is being installed. Full interface demarcation capabilities are available, using stop/start or thermo-electric methodologies. Instrumented ampoules and cartridges are fabricated in collaboration with the Chemistry Glass Shop. Current projects focus on the growth of infrared detector materials and high performance magnetic composites.

The Magneto-Optic Materials Lab is a facility for the preparation and characterization of magnetic thin films with large magneto-optic effects. Thin film deposition equipment consists of an ultrahigh-vacuum (UHV) metal MBE, a three-source electron beam evaporator, and a high rate magnetron sputtering system. Other characterization equipment includes a special optical dewar, a vibrating sample magnetometer, an inductive hysteresis loop tracer, and Hall effect and magneto-resistance loop tracers.

The Mechanical Testing Laboratory contains state-of-the art tensile, impact, fatigue, and hardness devices to measure basic and fundamental properties of materials. The prime equipment consists of a servo-hydraulic Instron which has numerous ancillary load-cells, several independent LVDTs, and a 10-channel Ashay strain gage system. This system can be coupled with a 2-channel Physical Acoustics acoustic emission arrangement to quantify cracking mechanisms within material systems. Work has been performed on a broad range of metal, ceramic, polymeric, composite, biomedical, and coated materials to establish performance characteristics.

The Polymer Structure Laboratory examines polymer surfaces and interfaces using a variety of techniques, including: secondary ion mass spectroscopy; atomic force microscopy; ion, X-ray, and neutron scattering; TEM and Nomarsky microscopy; and FTIR, contact angle, and Mossbauer spectroscopy. Major pieces of equipment include: neutron reflectometer, digital nanoscope IIIa atomic force microscope, LB Trough and HV annealing ovens.

The Surface Science Laboratory houses two UHV chambers with LEED and Auger-electron spectroscopy (AES) facilities, and a UHV chamber with scanning tunneling microscope (STM) for studies of surface crystallography of metals and semiconductors, and for the growth and analysis of ultra-thin epitaxial films.

The Synchrotron X-Ray Topographic Analysis Laboratory has facilities at Brookhaven National Laboratory and at Stony Brook. The primary equipment consists of a synchrotron beamline (National Synchrotron Light Source beamline X-19C) dedicated to synchrotron topography (with all of the necessary ancillary equipment for computerized motor control darkroom facilities, etc.). Further support equipment, such as more darkroom facilities, microscopes, and conventional X-ray generators for orientation analysis, is located on campus at Stony Brook. Facilities on campus will soon be enhanced with the purchase of a high-resolution triple-axis X-ray diffraction system capable of use with either synchrotron radiation or conventional X-rays.

The Thermal Property Laboratory consists of DTA/TGA, a 1600C double push rod dilatometer, and a holometrix laser flash thermal conductivity system (room temperature measurements). The facility also contains a fully instrumented thermal cycling test rig.

The Thermal Spray Laboratory (TSL) is a unique facility containing a vast array of industrial-level plasma and combustion spray devices. TSL equipment includes: combustion wire, rod, and powder feed thermal spray torches; two-wire electric arc guns; a wide range of plasma spray devices, both hand-held and automated; reduced pressure plasma spray system; water-stabilized high throughput 160 kw PAL plasma gun; high velocity oxy-fuel spray device (HVOF); and detonation (high velocity) spray devices. The Thermal Spray Laboratory operates under the auspices of the Center for Thermal Spray Research, an NSF Materials Research Sciences and Engineering Center.

The Thin Film and Interface Laboratory provides a variety of tools for fabricating and studying controlled interfaces between crystalline materials. Emphasis in the laboratory is on grain boundaries (both in bulk and thin-film materials) and interfaces between films and their substrates.

The Tribology Laboratory consists of a ball-on-disk tribometer for friction and wear measurement (based on the Versailles Advanced Materials and Standards Protocol), a ball-on-flat single point scratch tester, slurry abrasion tester, ASTM G-76 erosion tester from room temperature to 500°C, and cavitation erosion tester. Surface analysis equipment includes a Zygo 3-D interferometer and precision weight loss measurement system.

Brookhaven National Laboratory

At Brookhaven, the facilities available to the department include particle accelerators for carrying out ion beam surface modification experiments and highly sophisticated surface analysis probes. The National Synchrotron Light Source (NSLS) is also located at Brookhaven. As one of the participating research teams at NSLS, the Synchrotron Topography Research Group, centered in Materials Science and Engineering, is using special X-ray methods to image nondestructively dislocation microstructures. The topographic method is also being used in department-based study of surface chemical reactivity. A newly commissioned neutron reflection spectrometer managed by the department's Polymer Group provides researchers with atomic-scale structural and chemical information about the near-surface properties of liquids and solids. The department also has access to a new, 300keV field emission transmission electron microscope, providing ultrahigh resolution capability, and a variety of analytical tools such as energy-dispersive X-ray spectrometry, energy-filtered imaging, and electron holography.

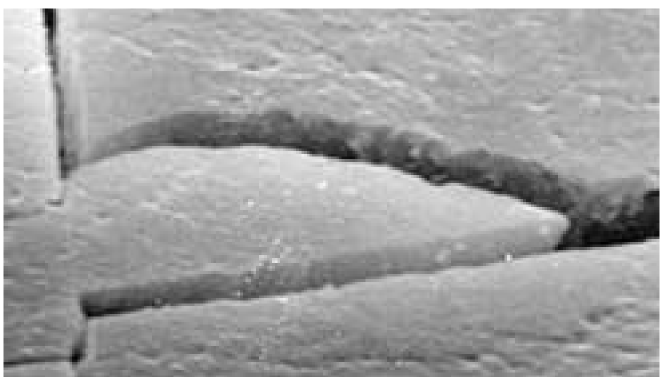
Computer Facilities

In addition to workstations in the department, there are many microcomputers clustered elsewhere on campus. High-speed networking lines allow users remote access to Materials Science facilities from off-campus as well. Most faculty members have computers located in their labs, with software and hardware tailored to their individual research programs. Computing facilities are upgraded on a regular basis in order to ensure access to state-of-the-art equipment at all times.

Thermal spray of protective coating onto steel substrate.

Our Distinguished Faculty

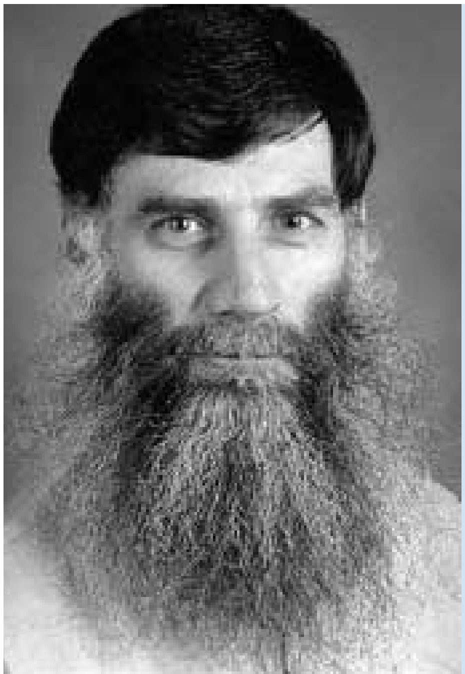
The department boasts a distinguished and hard-working faculty. All of the professors have research support from national or international agencies. Many have been honored with fellowships from professional and learned societies such as ASM International (Herman, King, Berndt); the American Ceramic Society (Herman); the American Physical Society (Jona, Rafailovich); the Australian Institution of Engineers (Berndt); the Institute of Electrical and Electronic Engineers (Gambino); the U.K. Institute of Materials (King, Berndt); and the Japan Society for the Promotion of Science (King). Professor Larson has received more than a dozen awards from NASA for his research achievements.



An unusual fracture pattern within a Zirconia-Zirconia Composite (the longitudinal dimension is 25µm).

The faculty is also actively involved in editing journals and books, and many hold positions on editorial boards. Professor Herman was the editor-in-chief of the journal *Materials Science & Engineering A*, from 1983 until 1997. Professor Berndt edits the *Journal of Thermal Spray Technology*. Professor Jona's book on ferroelectric crystals has been declared a "citation classic" by the Institute for Scientific Information, in view of the enormous number of researchers who have referred to it in their own published work.

In 1995, Professor Richard Gambino was awarded the National Medal of Technology in a ceremony at the White House. Only one such award is made each year.



CHRISTOPHER C. BERNDT, Professor

Ph.D. 1981, Monash University, Australia

Chris Berndt researches thermal spray coatings and their failure processes. These coatings can be classified as "composite-like" in character and, in this fashion, various microstructural phenomena can be scientifically analyzed. His specific areas of interest include coatings for biomedical, power generation, and infrastructural applications. A particular analysis technique that he has championed is that of acoustic emission whereby sensors placed on coatings can be used to detect and amplify cracking processes in situ. In this fashion, he has been able to develop tools that can be used to predict the onset of coating failure and, thereby, the spray parameter variations of thermal spray are now better understood. Berndt is also editor-in-chief of *The Journal of Thermal Spray Technology*—the only journal that is dedicated to this area of science and technology.

(516) 632-8507, cberndt@notes.cc.sunysb.edu

CLIVE R. CLAYTON, Professor

Ph.D. 1976, University of Surrey, England

It has been the philosophy of Clive Clayton's laboratory to utilize the powerful tools of surface science for the study of industrially relevant surface and interfaces. For this purpose the lab has developed a surface analysis laboratory that consists of several X-ray photoelectron spectrometers and two scanning auger microscopes. These facilities have been used to pursue a better understanding of the passivation of engineering alloys in aqueous media. Passive films having thicknesses of 1-10 monolayers can be studied by these techniques without removing the films. To prepare passive films and to test their effectiveness in a variety of corrosive media (including microbial environments), electrochemical polarization techniques are utilized. Clayton's lab is collaborating with the Mechanical Engineering department in order to correlate surface chemistry with the corrosion fatigue of aircraft grade aluminum alloys. This study also seeks to correlate laser speckle interferometer measurements with the early stages of localized corrosion.

(516) 632-8504, cclayton@ccmail.sunysb.edu

MICHAEL DUDLEY, Professor

Ph.D. 1982, University of Warwick, England

Michael Dudley has directed the Stony Brook Synchrotron Topography Facility at the National Synchrotron Light Source at Brookhaven National Laboratory since 1987. His specialties include synchrotron topographic analysis of defects and generalized strain fields of single crystals in general, with particular emphasis on semiconductor, optoelectronic, and optical crystals. Establishing the relationship between crystal growth conditions and resulting defect distributions is a particular thrust area of interest to Dudley, as is the correlation between electronic/optoelectronic device performance and defect distribution. He also actively pursues topographic studies of dynamic phenomena. His current research is funded through AFOSR/DARPA, ARO, NASA, and industry (Cree Research Inc., ATMI, and Sterling Semiconductor).

Dudley is a member of ASM International, the American Chemical Society, and the Materials Research Society. He has authored in excess of 100 articles.

(516) 632-8500, mdudley@notes.cc.sunysb.edu

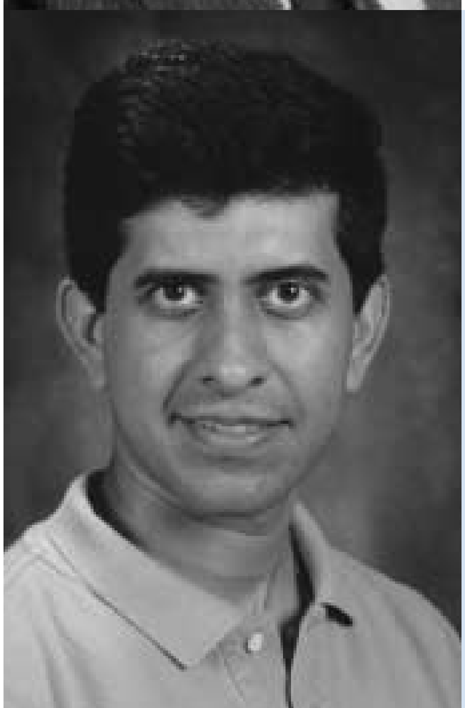
RICHARD J. GAMBINO, Professor

M.S. 1976, Polytechnic Institute of New York

Richard Gambino does research on magnetic and magneto-optical materials and devices. He invented the materials used in magneto-optical storage disks. In 1995 he received the National Medal for Technology for this work. His current research interest is magnetic exchange interactions at phase boundaries. A new class of giant magnetoresistance materials has been discovered based on anti-ferronmagnetic exchange at the boundary between two ferronmagnetic phases.

Gambino has studied a wide range of electronic materials including magnetic thin films, oxide superconductors, intermetallic compounds, and magnetic oxide crystals. Prior to joining the Materials Science faculty in 1993, Gambino was a member of the research staff at IBM Research, and has some 40 patents to his credit.

(516) 632-9513, rgambino@ccmail.sunysb.edu



DILIP GERSAPPE, Assistant Professor

Ph.D. 1992, Northwestern University

Studying statistical mechanics and computer modeling of complex chemical systems is at the heart of Dilip Gersappe's research. He investigates the behavior of self-assembling polymeric and biopolymeric systems, and is developing theories for the properties of polymer blends and the behavior of polymers at surfaces and interfaces.

In recent work, Gersappe has used mean field theories to determine the effect of confinement on the properties of thin film polymer blends. In other work, he has used molecular dynamics simulations to isolate the molecular mechanisms of failure in polymeric adhesives. Currently, he is developing parallel molecular dynamics techniques to study the strengthening mechanisms in polymer nanocomposites and to investigate the factors that control the permeability of polymeric membranes.

(516) 632-7642, Dilip.Gersappe@sunysb.edu

GARY HALADA, Assistant Professor

Ph.D. 1993, State University of New York at Stony Brook

Gary Halada is associate director of the Laboratory for Surface Analysis and Corrosion Science. His research involves the use of surface analytical equipment, including novel development of laboratory and synchrotron-based infrared surface microspectroscopy (in association the National Synchrotron Light Source at BNL), in the study of environmental degradation and corrosion, protective coatings development, decontamination of metallic surfaces, and ion beam surface modification. In addition, he works on a number of industrial collaborations in failure analysis and multilayer device fabrication through the Strategic Partnership for Industrial Resurgence.

Halada is an active member of the American Vacuum Society, the Electrochemcial Society, the Materials Research Society, and the American Society for Engineering Education. He is also the coordinator for the undergraduate Engineering Science computer laboratory.

(516) 632-8526, ghalada@ccmail.sunysb.edu

PATRICK J. HERLEY, Professor

Ph.D. 1961, Rhodes University, South Africa

D.SC. 1982, Imperial College, University of London

Patrick Herley directs his research at determining the fundamental concepts underlying the chemical reactivity of certain inorganic solids. These concepts are of paramount importance in understanding the mechanism whereby these solids react (decompose) under the influence of external stimuli (heat, light, ionizing radiation, etc.). The mechanisms of incipient decomposition involve studies of structure-sensitive nucleation and growth of product phases in these solids.

Materials currently under investigation in Herley's lab include: hydrides, alkali borohydrides, metallic azides, nitrates, and perchlorates. Typical techniques that have been applied to the study of these materials and their products include transmission X-ray diffraction topography; optical absorption spectroscopy; optical, scanning electron, and electron-analytical microscopy; and thermal analysis.

(516) 632-8478, pherley@ccmail.sunysb.edu

HERBERT HERMAN, Professor

Ph.D. 1961, Northwestern University

In addition to directing the Center for Thermal Spray Research, Herbert Herman engages in research on thermal spray science and technology, which involves the high velocity melt-spraying of materials to form enhanced performance protective coatings of metals, ceramics, and polymers. Supported by an NSF "Materials Research Science and Engineering Center" grant, Herman and his colleagues are exploring means through which processing can control deposit microstructure and thus properties. In particular, Herman's work focuses on the imperfection structure associated with thermal spray deposits.

Herman also has research activities in ocean engineering, principally involving marine materials. His lab has a long-term program underway aimed at the protection of materials at sea. The group's work involves the thermal spray metallization of structural steel, yielding long-term corrosion protection in a wide range of industrial and marine environments.

(516) 632-8510, hherman@ccmail.sunysb.edu

FRANCO P. JONA, Professor

Ph.D. 1949, Swiss Polytechnic Institute, Switzerland

Franco Jona studies the physical and chemical properties of solid crystal surfaces; in particular, the arrangement of atoms in the first few atomic layers of metal and semiconductor surfaces, using low-energy electrons as a probe. He is also engaged in the study of epitaxial ultrathin films of metals on metals or semiconductors (ultrathin films have thickness of only ten or twenty atomic layers). Such films allow the growth of new, metastable phases of the film material, i.e., phases that are not found in nature at ordinary temperatures or pressures.

Before joining Stony Brook in 1969, Jona spent ten years at the IBM Research Center doing research on various aspects of crystal growth and crystal physics. In 1960, he co-authored a book on ferroelectric crystals, which is now considered a classic in the field.

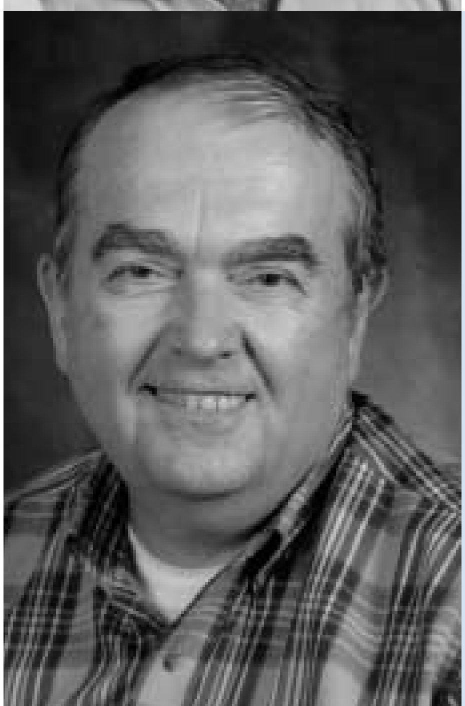
(516) 632-8508, franco@ccvm.sunysb.edu

ALEXANDER H. KING, Professor
D.Phil. 1979, Oxford University

Alex King works on grain boundaries and other interfaces, with a special emphasis on polycrystalline thin films of a variety of different materials. Using electron microscopy and a range of theoretical approaches, his research group is developing a detailed understanding of the forces that influence grain boundaries in thin films, and how the grain boundaries influence the properties of the films. Recent work has focused upon the junctions of grain boundaries, called “triple lines” and the work has applications ranging from electronic materials to thermal barrier coatings.

King has published over 100 refereed papers and has edited four technical books. He is a fellow of both ASM International and the Institute of Materials (UK). King is also the print and electronic media review editor for the Elsevier journal, *Materials Science & Engineering A*, and a member of the board of *Review of Metallurgical Transactions A*.

(516) 632-8499, Alexander.King@sunysb.edu



DAVID J. LARSON, JR., Professor
Ph.D. 1984, Northwestern University

Helping NASA reach for the stars is one of David Larson’s many activities. During his 27 years at Grumman Aerospace Corporation, he worked on specific aircraft applications involving shape-memory (smart) materials, Sn-coated copper wire aging, and eutectic brazements for titanium structures. In 1972 he began a long, continuing collaboration with the Office of Life and Microgravity Science and Applications Division of NASA, studying the influences of gravitational phenomena on solidification and crystal growth.

Larson’s current interests include: microgravity science; high-fidelity solidification process modeling development for eutectic solidification and crystal growth; and crystal characterization using infrared and X-ray spectroscopy and synchrotron topography. Current NASA projects include: Orbital Processing of Zn-alloyed CdTe Compound Semiconductors, Orbital Processing of Eutectic Rod-Like Arrays (OPERA), and Thermal Equilibration and Chemical Homogeneity (TEACH). It is anticipated that the OPERA and TEACH experiments will be flown on the Space Shuttle or the International Space Station.

(516) 632-8485, dlarson@ccmail.sunysb.edu

MIRIAM RAFAILOVICH, Professor
Ph.D. 1980, State University of New York at Stony Brook

While earning her Ph.D. in Nuclear Physics, Miriam Rafailovich specialized in the study of magnetic properties of metals using nuclear techniques. She then took an appointment at Brookhaven National Laboratory where she did further studies in the field of solid state magnetism before she joined the Materials Science department. Today, Rafailovich now devotes most of her research effort to the study of polymers. In this area, she has worked on problems of ordering in polymer mixtures and at liquid interfaces, defect structures in block polymer systems, adhesion between different polymers and dynamics of ion-containing polymers. Her experiments on polymers involve atomic force microscopy, electron microscopy, X-ray and neutron reflection measurements, and ion scattering.

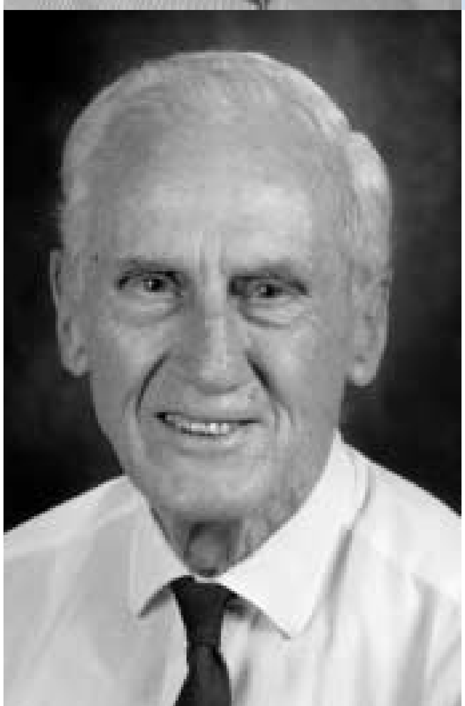
(516) 632-8483, mrafailovich@ccmail.sunysb.edu

SANJAY SAMPATH, Associate Professor

Ph.D. 1989, State University of New York at Stony Brook

Sanjay Sampath's research encompasses the fields of thermal spray processing of materials, tribology of protective coatings, and the synthesis and application of functionally graded materials. His specific current research focus includes microstructural control during thermal spray deposition and establishing process-microstructure-property relationships. As part of this activity-wide ranging materials including metals, intermetallics, ceramics, and composites are being investigated through a variety of non-equilibrium spray processes. A consequence of the research is the development of novel layered and functionally graded microstructures, wherein materials design and processing are interlinked to provide optimum surface engineering solutions. He is also interested in the application of these layered and graded surfaces to mitigate against contact damage and wear, and as such tribological evaluation of these complex systems is being studied.

(516) 632-9512, ssampath@ccmail.sunysb.edu



LESLIE SEIGLE, Professor Emeritus

D.SC. 1951, Massachusetts Institute of Technology

Dr. Leslie Seigle's research interests lie in the general areas of thermodynamics of solids, diffusion in solids, and the theory of solid-state sintering. He has been actively engaged in studies of the thermodynamics of solid metallic solutions, mechanisms of formation and degradation of aluminide and similar types of protective coatings on high-temperature alloys, and the role of diffusion processes in the sintering of solids. His work includes detailed investigations of the thermodynamic activity of oxygen, nitrogen, and carbon in the refractory metals; diffusion in the nickel-aluminum and iron-aluminum systems; and thermodynamics and kinetics of the pack-aluminization process.

Seigle was a member of the New York University-Moscow Steel Institute Exchange of Metallurgical Delegates in 1957, chairman of the National Academy of Sciences, Material Advisory Board Panel on the Fundamentals of Coating Systems from 1967-1969, and is past chairman of the N.Y. chapters of ASM and AIME.

(516) 632-8514, lseigle@ccmail.sunysb.edu

JONATHAN C. SOKOLOV, Professor

Ph.D. 1983, State University of New York at Stony Brook

Before joining Stony Brook's faculty in 1992, Jonathan Sokolov began his work in the area of polymer studies at the Weizman Institute of Science. Currently, his research on polymers includes studies of diffusion, surface and interfacial properties, ordering in polymer blends and dynamics in thin films. To study polymers, Sokolov uses various experimental techniques, such as ion and neutron scattering, atomic force microscopy, mechanical measurements, and optical microscopy. Experiments are carried out at Stony Brook and in collaboration with various scientists at other laboratories, especially using advanced facilities at nearby Brookhaven National Laboratory.

(516) 632-8483, jsokolov@ccmail.sunysb.edu

Perspectives

Plasma spraying of ceramic onto a material to be protected from high temperatures.

Personal Statement from alumnus Dr. Carl J. Czajkowski, Brookhaven National Laboratory

I am currently the associate division head of the Environmental and Waste Technology Center at Brookhaven National Laboratory. When asked to write about the Materials Science program at Stony Brook, I wondered what I could possibly tell people coming into the science and technology arena, especially young people. I guess that I am an unusual case since I received my Ph.D. at Stony Brook when I was 48 years old. I could not have accomplished this without the encouragement and support of friends, family, and especially the faculty at Stony Brook. The professors in the Materials Science and Engineering department are more than just teachers; they become your colleagues and friends. I had the opportunity to continue my studies at other institutions, but chose instead to work with the outstanding professionals at Stony Brook — Professors King, Berndt, and Herman are very capable scientists in their own right who have taken it upon themselves to impart knowledge to students interested in the materials area. The Thermal Spray Laboratory in the department is world-class, and provides a fertile environment for learning and student development. All in all, I am very pleased with my experience at Stony Brook while obtaining my degree, and have maintained a connection into the present with proposal submittals, which include partnering with this outstanding department.

Doctoral Student Henry J. White

The Materials Science and Engineering department at Stony Brook is one of the leading Materials Science Research departments in the country. As a student, I've always felt that I am in the land of opportunity. I was blessed with a fellowship/teaching assistantship during my first semester, and, since then, I've had the pleasure of attending lectures from some of the leading scientists and engineers in their fields; lecturing in undergraduate core curriculum courses each semester; working with scientists using state-of-the-art and leading-edge instrumentation at Brookhaven National Laboratory; and working with a talented group of high-school students who became Westinghouse Science Competition awardees.

This is my second re-entry into academia from my 10-year industrial career. My intent was to share (with future engineering professionals) some of my experience as an engineer. Upon graduation, I will be in the enviable position of either pursuing a career in academia or furthering my success in industry.

Alumnus Aron Newman

One particular aspect of the program I really appreciated was the opportunity to do my own research. The faculty provided me the access to people, technical meetings, and facilities outside the department to help me complete my research.

"They offer a strong emphasis on performing research. The classes teach you the basics; the research teaches you the specifics."

My first year was very exciting, a whirlwind of knowledge. I did not come from a background in materials science, so I had a lot of catching up to do. Interaction with the students was also very important during this time, especially when it came to selecting my advisor. The openness and friendliness of the students in the program helped me to make my decision. It wasn't just the research that influenced who I picked for my advisor — I also considered the students I would be interacting with for the next five years. During your research, you spend more time with your fellow students than with faculty, learning how to do research. The older students already in the program are very supportive and help you learn the ropes.

The diverse backgrounds of the students are one of the department's greatest strengths. The department is very supportive of people who don't have formal training in materials science. They offer a strong emphasis on performing research. The classes teach you the basics; research teaches you the specifics.

Through this program I have learned the skills to be a materials scientist, have gained the practical experience with the tools a materials scientist uses, and have learned how to evaluate the merit and quality of my own work and the work of others. I am very critical of what's reported, now that I have the tools to be more discriminating about what's represented in articles. That knowledge comes with experience, and I gained that experience at Stony Brook, doing research and writing papers. The program helped me to become a critical thinker.

Eye on Alumni

Current Positions Held by Selected Program Alumni (Ph.D. unless noted)

1971 Kedar Gupta (M.S.), President, GT Equipment Technologies, NH.

1976 Hungdah Shih (M.S.), Research Lab, Texas Instruments.

1978 Carol Jantzen, Technical Staff, Savannah River Lab.

1981 Mitchell Dorfman (M.S.), Vice President, Sulzer-Metco Inc.

1984 Venkatraman Garke (M.S.), Sematech, Houston, TX.

1986 Fu-Rong Chen, Professor, National Tsing-Hua University, Taiwan.

1987 Fusen E. Chen, Vice President, Applied Materials, San Jose, CA.
Lucille Ann Giannuzzi (M.S.), Associate Professor, University of Central Florida.
Mark Nameroff (M.S.), Eaton Corporation.

1988 Re-Jehn Jahn, Ford Research Labs.

1989 Girish Dixit, Texas Instruments.
Richard Neiser, Senior Technical Staff, Sandia National Lab, NM.

1990 Nataraj Chandrasekhar, Indian Institute of Physics.
Deepak Goyal, Intel Corporation.
Robert Greenlaw (M.S.), Manager, Sermatech Corp.
Keith Kowalsky (M.S.), Engineer, Flame Spray Industries.
Lysa Russo (M.S.), Engineering Manager, Sulzer-Metco Inc.
Kisoo Shin, Hyundai Electronics Corporation, South Korea.

1991 A.Y. Corcoran, Research Manager, RSM Electron Power.
Rajesh Tiwari, Research Engineer, Motorola Inc., TX.

1993 Robert Borra (M.S.), Engineer, Materials Research Corp.
Chris Perdikaris (M.S.), Manager, Bender Machine Inc.
Abha R. Singh, Texas Instruments Development Center, Dallas.

1994 Liya Liang, President, Precision TEM Inc.
Wei-Zhong Zhao, Polymer and Colloid Research, Xerox Corporation.

1995 Raphael Benary (M.S.), Research Engineer, Sulzer-Metco Inc.
Yun Liu, Polymer Research, Kodak.
Lien-Chang Wang, R&D Engineer, Magnetic Head Materials, Read-Rite Corporation.
Jenn Yue Wang, Engineer, Applied Materials.
Shaoping Wang, ATMI, Danbury, CT.
Kevin Tso-Li Wu (M.S.), Process Engineer, Samsung Semiconductor.

1996 Carl Czajkowski, Scientist, Environmental Waste Center, Brookhaven National Laboratory.
Chien Ouyang (M.S.), Senior Engineer, Express Packaging Systems Inc.
Jeff Brogan, President, Poly Therm Corporation, NY.
Thomas Fanning, MODE, a division of Emcore Corporation.
Robert Gansert, Senior Engineer, Hardface Alloys Inc.
Joshua Margolies (M.S.), Research Engineer, State University of New York at Stony Brook.

A Space Shuttle orbiter in flight. Professor David Larson and his students are currently developing two materials science experiments that will fly on the Space Shuttle and/or the International Space Station. These experiments use the orbital environment to minimize gravitational influences on mass transport, solidification, and crystal growth processes.

1997 Varun Singh, Process Engineer, Dallas Semiconductor, Inc.
Ying-Yi Fred Chen, Nano-Architect, Research Corporation, Taiwan.
Hua Chung, Engineer, Applied Materials.

1998 Rand Dannenberg, Research Engineer, British Oxygen Corporation, CA.
Glenn French (M.S.), Process Engineer, AIL Systems.
Yuan-Shan Guo, Micron Technology.
Manuel Monserrat (M.S.), Process Engineer, AIL Systems.
Aron Newman, Research Scientist, Argonne National Laboratory, IL.
Shi-Chun Qu, Applied Polymer Research, Gore Inc.
William Smith (M.S.), Engineer, Caterpillar Corporation.

Living in Stony Brook

The University is located in one of the East Coast's most desirable spots—the North Shore of Long Island, about 60 miles east of New York City (midway between Montauk and Manhattan). The tranquil waters of Long Island Sound are just minutes away to the north, and the white sandy beaches of the Atlantic Ocean beckon southward.

North of the University, within easy bicycling distance, lies the historic village of Stony Brook. Its quaint shopping area was created by Ward Melville, heir to the Thom McAn shoe fortune. (Ward and his wife, Dorothy, donated the land where the campus now stands.) One of the best ways to experience Stony Brook village is to pick up an ice cream cone from the Brook House luncheonette, sit on the village green, and enjoy an unobstructed view of the sunset. Across the street is the landmark Three Village Inn, dating back to pre-Revolutionary days. The Stony Brook Grist Mill, built in 1751, is a working mill open to the public for tours. The Mill Pond across the street (a perfect place to stroll and feed the ducks) is fed by the original "stony brook"; the Setalcott Indians called this stream *Cutsgunsuck*, or "brook laden with small stones."

Students enjoy lunch and conversation outside the new Student Activities Center.

Historic Surroundings

During the American Revolution, the entire Three Village area—though officially Loyalist territory—was a hotbed of colonial spy activity. One Setauket lady devised a code to signal patriots waiting to learn if the coast was clear: she hung different color combinations of laundry to communicate top-secret messages. And it's said that the Country House restaurant, which started life as a private residence and today serves modern-day diners, houses a ghost who still thumps across the floor of her second-story room.

Cultural Diversity

Culture abounds on Long Island. Although Manhattan is only a train ride away, theatre lovers need travel no further than the Staller Center for the Arts. Located on the Stony Brook campus, the Staller Center presents hundreds of plays, concerts, and special events each year. It houses the 1,100-seat Main Stage Theatre, a 400-seat recital hall, three experimental "black box" theatres, and a 4,700-square-foot art gallery. Staller's summer film festival is recognized as a "mini-Sundance." Live theatre is also offered in nearby Port Jefferson (ten minutes away); the village's Theatre Three offers performances of Broadway and off-Broadway shows, and acting classes. The theatre building itself, a former vaudeville palace, dates back to the 1800s. In Stony Brook village, the Museums at Stony Brook are a must for art and history lovers. The complex of historic buildings houses one of the world's largest collections of horse-drawn carriages, and the paintings of William Sidney Mount, a Stony Brook native who became the nation's first famous "genre" painter. Local cafes and bookstores make Stony Brook a good place to browse.

The village of Huntington offers the Cinema Arts Center, where one can view the latest "indie" films. In recent years Long Island has developed a reputation for its blues music scene, but a growing number of coffeehouses present other types of music as well; folk, bluegrass, and jazz are just a few of the styles you'll find.

For sports and fitness enthusiasts, the University has a 5,000-seat indoor Sports Complex. Plans are underway for the construction of an outdoor stadium for sporting events and concerts. The Student Activities Center houses the Eugene Weidman Wellness Center, which offers fitness classes in everything from aerobics to yoga, and state-of-the-art exercise equipment. If professional sports are your thing, Long Island has its own Stanley Cup champion New York

Situated between Manhattan and Montauk, Stony Brook offers the best of both worlds. Our central location provides students with access to a variety of shopping areas, historical landmarks, beautiful parks and beaches, and Broadway-quality entertainment at the Staller Center on campus.

Islanders ice hockey team. The excitement of Madison Square Garden, Yankee Stadium, and Shea Stadium (home of the New York Mets) is only 60 miles away.

Long Island is heaven for "foodies"; just about every cuisine you might think of—Afghani, Thai, Indian, etc.—can be sampled here (along with a liberal sprinkling of seafood shacks). The region's growing reputation as a producer of excellent wines makes for a pleasant day's tour of Long Island wineries.

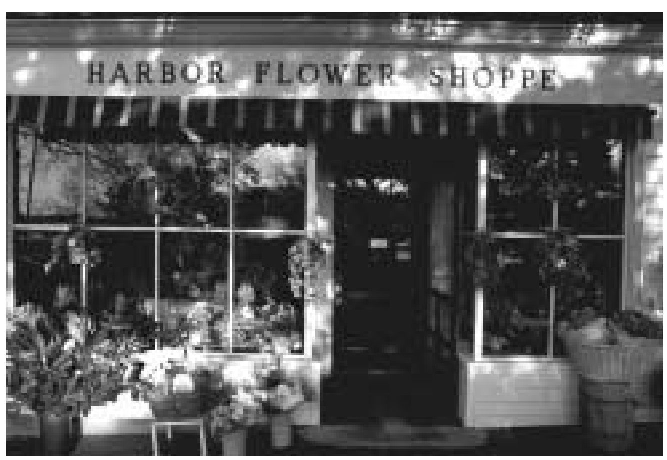
For those who like to "shop till they drop," Long Island does not disappoint. It's home to Roosevelt Field, once the starting place for Charles Lindbergh's famous solo flight and now a nationally known shopping mall. Long Island offers every type of store, from the nation's first supermarket (King Kullen) to retail outlets.

Nature's Bounty

Long Island is rich in wild landscapes. The campus is close to the Fire Island National Seashore. To the east lies the unique ecosystem of the pine barrens, where The Nature Conservancy maintains a number of hiking trails and nature preserves. And of course, the area's miles of seacoast make it paradise for boaters, anglers, and windsurfers. In fact, the campus is surrounded by Long Island maritime heritage. Port Jefferson (originally called "Drowned Meadow"), Setauket, and Stony Brook itself were once bustling shipbuilding centers; today the ferry that links Port Jeff to Bridgeport, Connecticut, makes the Three Village area a convenient jumping-off point for trips to New England.

Life at Stony Brook has something for everyone. There is the tranquil pace of the surrounding community, which has managed to preserve an old-fashioned, small-town atmosphere. At the same time, there are the cutting-edge resources and the abundant culture of the University itself.

At Stony Brook, we believe diversity is an integral component of the intellectual experience. Since 32 percent of our graduate enrollees are African American, Latino, Native American and international students, our University is a place where cultures converge.



From quaint flower shops to the popular Three Village Inn, Stony Brook village provides hours of shopping as well as dozens of dining possibilities.

Application and Admission

Application Materials and Deadlines

Application

Application forms can be obtained by calling the Materials Science and Engineering departmental office at (516) 632-8484; by writing to the Director of Graduate Studies (Department of Materials Science and Engineering, State University at Stony Brook, Stony Brook, NY 11794, USA); or from our Web page at *http://dol1.eng.sunysb.edu/matsci.html*.

Besides completing the application form, applicants will need to provide (1) official transcripts of undergraduate and (if applicable) graduate coursework; (2) official Graduate Record Examination (GRE) scores (Stony Brook's code for score reporting is 2548); (3) acceptable score (at least 600) on TOEFL for foreign students; (4) three letters of recommendation; and (5) a non-refundable $50.00 fee.

Send your application directly to us at: Department of Materials Science and Engineering, State University at Stony Brook, Stony Brook, NY 11794-2275, USA. Most students are admitted in the Fall semester, which begins at the end of August. The deadline for receipt of all application materials for Fall admission is February 1; please contact us if you wish to be admitted in the Spring semester. Earlier submissions are encouraged, particularly for those wishing to be considered in the campus-wide competition for Graduate Council Fellowships (see right). Funding cannot be guaranteed to qualified applicants whose materials arrive after the deadline. Prospective students are encouraged to address specific questions to the Director of Graduate Studies at the above address, or to contact faculty members whose work they find interesting.

Admission

Admission is based upon the faculty's assessment of the applicant's aptitude for research and the compatibility of his or her interests with the active research programs and capabilities of the department. Applicants are advised to pay particular attention to their statements of purpose (page 3 of the application form). A bachelor's degree in engineering, mathematics, physics, chemistry, or a closely-related area from an accredited college or university is also required.

Roth Pond is just one of the many scenic spots on campus.

Financial Aid

Financial Support and Benefits

Graduate traineeships (teaching assistantships, graduate assistantships) are awarded on a competitive basis by the Graduate School on recommendation of the program for one year, and may be renewed for up to four years. Current stipends for the academic year (9 months) are approximately $9,908. Academic year research assistantships, currently $13,000 per year (or more) are available through the research programs of many individual faculty members. Although numbers vary, approximately 40 percent to 50 percent of graduate students beyond their first year are supported as research assistants. Optional enrollment in a comprehensive health and dental insurance plan costs $5 a month.

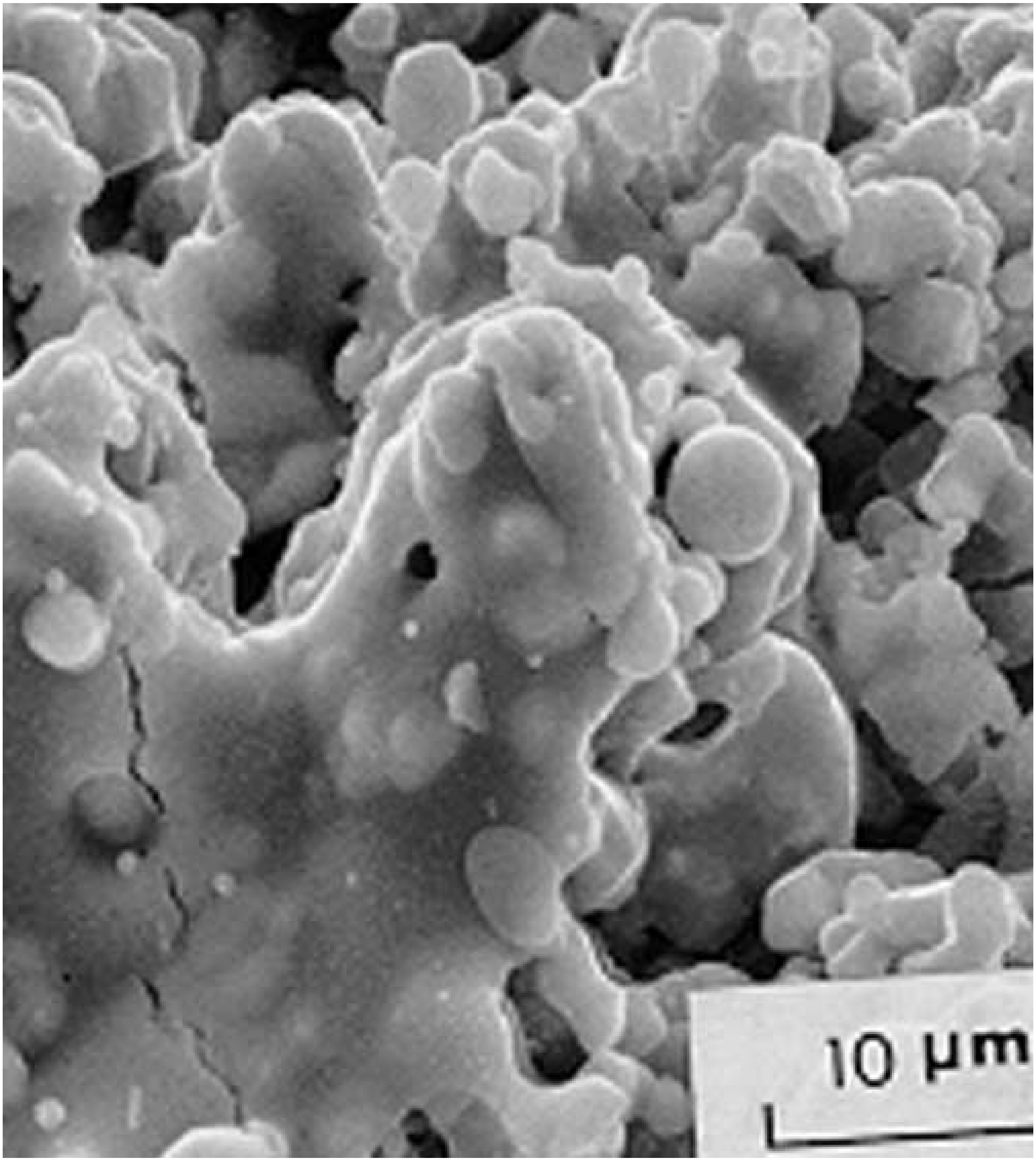
The University offers several scholarship programs to graduate students. These fellowships are awarded on the basis of merit. Graduate Council Fellowships are awarded to exceptional entering graduate students who are U.S. citizens. They provide five years of stipend support. W. Burghardt Turner Fellowships are awarded to outstanding incoming graduate students of Hispanic, African American, or Native American descent. They provide a stipend for two years.

Extramural Financial Support

Several government agencies and national foundations offer fellowships to support graduate students, including the National Science Foundation, the Howard Hughes Foundation, and the Brookhaven National Laboratory.

Students admitted to the program are strongly encouraged to apply for extramural funding to provide salary support, as well as to support their research. Some fellowships, such as those offered by NSF and the Hughes Foundation, are only available to beginning graduate students. Thus, prospective students are urged to begin preparing application materials for these fellowships before arriving at Stony Brook.

For more information contact the Office of Financial Aid and Student Employment at 516/632-6840; or visit the office on the Web at *http://notes.cc.sunysb.edu/Prov/finaid.nsf*.



A metastable structure of Yttria-Zirconia, which shows incomplete melting.

How to Get Here

Directions to the State University at Stony Brook

By Automobile

Take the Long Island Expressway (Route 495) to exit 62 N; follow Nicolls Road (Route 97) north for nine miles.

By Railroad

Take the Long Island Rail Road's Port Jefferson (516-231-LIRR) line to Stony Brook. Cross tracks for campus bus.

By Bus

Call Suffolk County Transit (516-852-5200) for schedules, rates, and routes for buses to campus from many local towns.

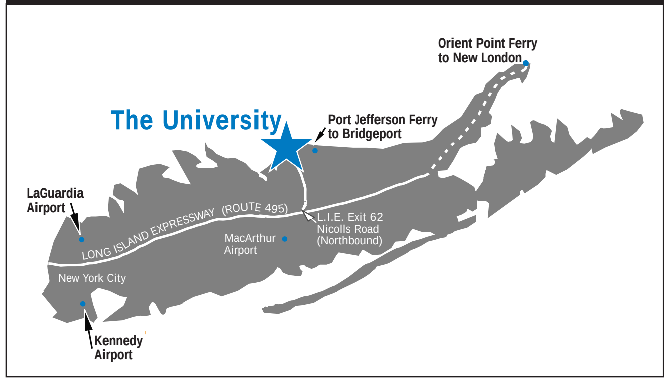
By Air

Land at Kennedy or LaGuardia Airport, 50 miles west of campus, or at Long Island MacArthur Airport (516-467-3210), ten miles south of campus. All airports offer limousine and taxi service to campus.

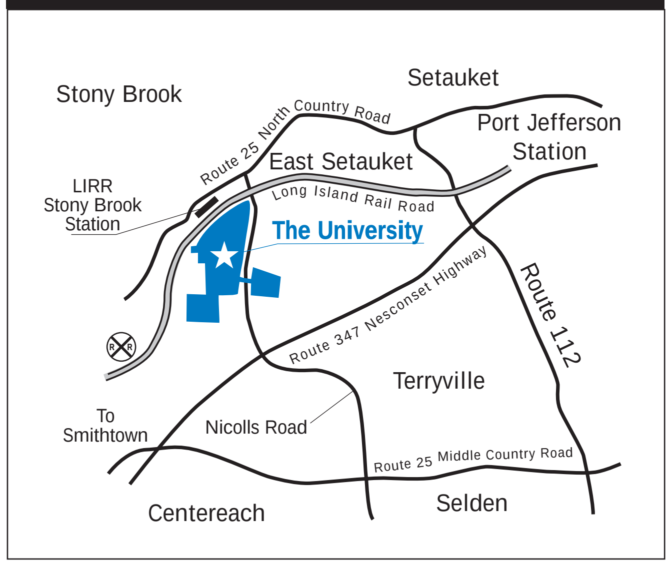
Ferry Connection

Connecticut car ferries run from Bridgeport to Port Jefferson (516-473-0286) and from New London to Orient Point (516-323-2525); call for schedules and information.

Long Island



University Area



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For more information, visit us on the Web at *http://www.sunysb.edu*.

On the cover: Dendrite shell structure on a rapidly solidified alumina particle, which exhibits high porosity. (The particle is 30µm in diameter and has been colorized.)