THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

DEPARTMENT OF PHYSICS

Birmingham, Alabama 35294

Students Accepted For Degree	FIELDS		
	Physics	Astronomy	Related Fields
Doctorate	X		
Master's	X		

1. General

President: Carol Z. Garrison
Dean of Graduate School: Brian D. Noe
Department Chairman: David L. Shealy
Graduate Program Director: Yogesh K. Vohra
Department Telephone Number: (205) 934-4736
Type of Institution: University
Control: Public
Setting: Urban
Total Faculty: 2,212
Total Graduate Faculty: 1,342
Total Students: 15,245
Total Graduate Students: 4,449
Annual Graduate Tuition:
In-state residents: Full-time—$182/cr. hr. (tuition)
Out-of-state residents: Full time—$455/cr. hr
Tuition rates for: 2007–08
Deferred tuition plan: No
Term: Semester
Note: Semester hours credit awarded

2. Number of Faculty in Department

The combined total of full-time faculty in the five professorial ranks is 20. The combined total of full-time, part-time, and other faculty at all ranks is 24.

3. Admission, Financial Aid, and Housing

Address admission inquiries to: Graduate School Office, HUC 511, 1530 3rd Avenue South, Birmingham, AL 35294-1150
Graduate application fee required: $35 (U.S. citizen); $60 (foreign applicant)
Admission deadline (Fall admission): 7/7
Admission information: For fall admission, 2007–08, 7 students were accepted.
Admission requirements: For admission to the graduate programs, a Bachelor's degree in physics is required with a minimum GPA of B specified. The GRE is required. The GRE Advanced is strongly urged. The average GRE score for 2007–2008 admissions was 1,237 (total). Students from non-English speaking countries are required to demonstrate proficiency in English via the TOEFL exam. Minimum acceptable score for admission is 550.
Undergraduate preparation assumed: Halliday and Resnick & Walker, *Fundamentals of Physics*; Thornton & Rex, *Modern Physics*; Fowles, *Analytical Mechanics*; Griffiths, *Introduction to Electrodynamics*; Reif, *Statistical Physics, Berkeley Course Vol. 5*; Zettilli, Nouredine, *Quantum Mechanics*.
Address financial aid inquiries to: David L. Shealy, Chairman, Department of Physics
GAPSFAS application required: No
Financial aid deadline: Priority deadline 4/1
Loans available: Yes
Address housing inquiries to: Housing Office.
On-campus, single student housing available: Yes
Cost/month: $200–400
On-campus, family housing available: No

Table A—Faculty, Enrollments, and Degrees Granted

Research Specialty	2007–08 Faculty	Enrollment[1] Fall 2007		No. of Degrees Granted[2] 2007–08 (2003–08)			Median No. of Years for 2003–08 Ph.D.'s
		Master's	Doctorate	Master's	Terminal Master's	Doctorate	
Astrophysics	4	0	3	2(4)	4(2)	0(0)	–
Biophysics	2	1	1	1(2)	1(1)	0(1)	0
Condensed Matter Physics	9	2	18	4(15)	3(6)	1(9)	6
Optics	4	1	3	0(5)	0(1)	0(4)	0
Physics Education	5	0	0	0(0)	0(0)	0(0)	–
Total		4	23	7(23)	5(10)	1(14)	
Full-time Grad. Stud.		3	23				
Part-time Grad. Stud.		1	0				
First-year Grad. Stud.		0	6				
Median Years in Grad. Study (2005–06 Degrees)						5	

Undergraduate Degrees, 2007–08 (2003–08): 4(21)

[1]Students not yet committed to a research specialty are entered under non-specialized.
[2]Five-year totals in parentheses.

4. Graduate Degree Requirements

Masters: 30 semester-hours of credit with thesis; minimum B (3.0 average); no residency requirements. Thesis is optional with approval of faculty. An additional "Interdisciplinary Track" for an M.S. degree with thesis option is also offered to non-physics majors and requires a minimum of 12 hours of graduate-level courses offered by other departments.
Doctorate: Minimum residence of three full-time academic years or equivalent periods of part-time enrollment with minimum GPA of B (3.0). Pass: oral placement exam on basic physics concepts; comprehensive exam covering the areas of classical mechanics, quantum mechanics, electromagnetic theory and two selected topics from thermodynamics/statistical mechanics, optics, or solid state physics in no more than two attempts; oral exam on area of research specialization; oral defense of written dissertation proposal; and oral final defense of dissertation.
Thesis: Thesis may be written *in absentia*.
Special Equipment, Facilities, and Programs: The department has active research programs in applied and theoretical astrophysics, biophysics, condensed matter physics, materials science, nanophysics, optics, lasers and laser spectroscopy. Op-

portunities exist for interaction with major government laboratories including NASA AMES Research Center; Jet Propulsion Lab; NASA Goddard Space Flight Center; NASA Marshall Space Flight Center; the Advanced Photon Source (APS) at Argonne National Lab; the National Synchrotron Light Source (NSLS) at Brookhaven National Lab; the Lawrence Livermore National Lab; Oak Ridge National Lab; Sandia National Lab; the Naval Research Lab; Wright Patterson Air Force Base–Air Force Research Lab; the National Cancer Institute at NIH; National High Magnetic Field Lab, Tallahassee Florida and the Center for Integrated Nanotechnology, Los Alamos National Laboratory Collaborations: Rice University, Florida State University, Vanderbilt, Wright State University.

Graduate Students and faculty have collaborative research Programs with several universities (Auburn University, University of Alabama at Huntsville, Arizona State University, North Carolina State University, Stanford University, University of California at San Diego, University of California at Los Angeles, and the General Physics Institute of the Russian Academy of Sciences), as well as with the UAB Medical Center. The department is part of a tri-campus interdisciplinary Materials Science Program.

Astrophysics and Solar-System Physics Labs have capabilities for Raman Imagery using Dilor XY 0.8-m 3-stage Raman spectrometer for acquisition of point spectra and Raman images displaying the distribution of molecular components, with Coherent krypton ion multi-λ laser (blue to IR) and Olympus BX40 microscope enabling common focusing for visible and laser illumination of the sample to 0.5 μm resolution (Lab for Paleobiological Chemical Imagery); Raman Spectroscopy using field-tested mini-Raman spectrometer with Control Development optics, operating at 785 nm or 670 nm, including SDL 8530 (785 nm, 300 mW) and Process Instruments PI-ECL-670-150 (670 nm, 150 mW) lasers, with EIC Raman probes for 785 nm and 670 nm: Transmission Spectroscopy (UV, Vis, IR) using Hewlett-Packard UV/Vis Diode Array Spectrophotometer for spectra from 190–400 nm; Vacuum-UV Spectrometer, for spectra from 100–250 nm; ThermoMattson InfinityGold FTIR Spectrometer for IR spectra in the range from 1–25 μm, resolutions to 0.5 cm^{-1}; Mattson Pollaris FTIR Spectrometer for spectra in the mid-IR (2.5–25 μm), resolutions to 1 cm^{-1}; far-IR to 400 μm with attachments; Mössbauer Spectroscopy with MS-1200 Ranger Scientific spectrometer at 0.1% linearity for transmission and backscatter; 50 mCi Co-57 source; Sample temperatures to 10K with ARS Displex Cryostat to 1000K with furnace; GMW water-cooled magnet for sample fields to 2.5 T; Chemical Analysis using Buck Scientific Gas Chromatograph, Model 910, with FID and PID detectors; D-Star Instruments Isocratic Liquid Chromatograph, model DLC-20; Dycor Quadrupole Mass Spectrometer; Sample Preparation using two ARS closed-cycle helium expansion systems and temperature controllers for T=6.5–300K; UV Photolysis System (Opthos) with microwave generator for 100–250 nm photons; Parr Instruments Reactor, D3141-1, for processing with H_2O at high T and high P; 2'' diameter Lindberg Tube Furnace to 1500C with digital multi-step controller.

Biophysics & Biophotonics Lab has capabilities for time-correlated single photon counting and laser tweezers operations using the following equipment: Coherent Verdi (10W)/Mira 900 D Ti:sapphire laser system, with frequency doubler/tripler, ps/fs operation, ''pulse picker'' (for lower excitation rate), broad-tuning optics set. Other capabilities include Fluoromax2 fluorometer, PC-controlled, 180–650 nm excitation, 180–700 nm emission, high sensitivity photon-counting electronics, full spectral corrections, spectral analysis software, Bioelectrospec TIRF system. TIRF bio-sensing setup; fiberoptic bio and chemical sensing setup; blue and infrared diode laser system; diode laser drivers; CO_2 laser based fiber and pipette puller to make fiber probes, CCD based microscope. Absorption Spectrophotometer using JASCO V-530 with programmable thermoelectric temperature controller, 180–1100 nm; Fluorescence Decay Systems using PicoQuant TimeHarp 200 TCSPC PC computer-board, two 50-ps PMTs (Hamamatsu R3809U-50 UV/VIS and R3809U-59 NIR) emission monochromator or wavelength filters, Globals multicomponent global convolution fitting software; Olympus IX-70 inverted microscope: Total Internal Reflection Fluorescence (TIRF)/Laser Tweezers input optics (including TIRF objective), Prior ProScan computerized stage, SIS F-View CCD camera with Microsuite Biological Suite/Scopeview software, 5-mm diam/4-m long fiber optic to relay fluorescence to SPEX fluorometer, multiphoton imaging & spectroscopy with Ti:sapphire laser system; Zeiss IM inverted microscope: with MTI SIT camera plus intensifier, CDS motorized stage. Brookhaven BI-200 SM light scattering system.

Computational Physics Lab has switched 10/100 Mbps LAN with gigabit ethernet connectivity to campus backbone and two OC3 links to the SouthernCross Roads (SoX) Internet2 Gigapop in Atlanta. This departmental network supports UNIX and Microsoft operating systems running on a range of workstations in faculty, staff, and graduate student offices and labs. The department has a 30 seat pc-cluster for use by general physics students with WebAssign, CAPA, Activ-Physics, MAPLE10, Photoshop7, SigmaPlot9, Scientific Word, MikTeX, and other software for research and educational activities. Physics participates in the operation and use of Beowulf clusters of parallel computing systems, Verari Systems cluster with 128 AMD CPUs, (Dell PowerEdge 6350 server with 32 Intel xeon CPUs running LINUX, another Dell PowerEdge cluster with 60 Intel Xeon CPUs and 16 AMD Opetron CPUs); active storage cluster (Dell 2650/1650) with 3TB online storage with LTO backup system. The department has access to two systems housed at the Alabama Supercomputer Center in Huntsville. The department has access to two systems housed at the Alabama Supercomputer Center in Huntsville. One system consists of 88 SGI Altix 350 and Altix 450 processors for a total of 176 CPU's with 784 GB of shared memory and 10.8 terabytes of storage. The entire system has a capacity of 948 GFLOPS. The second system is a Cray XD1 with 144 Opteron processors and 288 GB of distributed memory operating at 2.2 GHz for an overall capacity of 634 GFLOPS. The system has 3.4 terabytes of high performance storage. Physics faculty and students have Internet2 access to national supercomputer centers.

UAB HPC Resources

IBM Blue Gene/L System

IBM's BlueGene/L is a uniquely designed massively parallel supercomputer. A single BlueGene/L rack contains 1024 nodes, each node having two processors and 512MB of main memory. The 2048 processors in one BlueGene/L rack are tightly integrated in one form factor using five proprietary high-speed interconnection networks. This system has a theoretical 5.6-Teraflop computing capacity.

DELL Xeon 64-bit Linux Cluster-''Coosa''

This cluster consists of 128 nodes of DELL PE1425 computer with dual Xeon 3.6 GHz processors with either 2GB or 6GB of memory per node. It uses Gigabit Ethernet inter-node

network connection. There are 4 Terabytes of disk storage available to this cluster. This cluster is rated at more than 1.0 Teraflops computing capacity.

DELL Xeon 64-bit Linux Cluster w/Infiniband-"Olympus"
2-Verari Opteron 64-bit Linux Clusters-"Cheaha"
& "Everest"

This cluster is a 64-node computing cluster consists of dual AMD Opteron 242 processors, with 2GB of memory each node. Each node is interconnected with a Gigabit Ethernet network.

IBM Xeon 32-bit Linux Cluster-"Cahaba"

This cluster is a 64-node computing cluster consists of IBM x335 Series computer with dual Xeon 2.4GHz processors, 2 or 4GB of memory each node and a 1-Terabyte storage unit. Each node is interconnected with a Gigabit Ethernet network.

Materials Research Labs and Facilities include Materials Growth and Processing with 1.2 kW and 6 kW Microwave Plasma Chemical Vapor deposition systems for growth of homoepitaxial diamond and nanostructured diamond coatings on metals. Pulsed Laser Deposition Facility for growth of thin films including a Lamda Physik LPX305i Excimer laser, a unique custom-made deposition system developed in collaboration with Neocera, Inc., and a Novel Nanoparticle Beam Pulsed Laser Deposition. Aerosol Reactor for Synthesis and Processing of Nanostructured Materials. Physical Vapor Deposition (Denton Discovery-24 sputtering system equipped with 3-RF/DC capable magnetron sources), and solution deposition (Laurel Technologies programmable WS-400-6NPP spinner, HeatPulse 610 rapid thermal processing system, and programmable stirring hot plate) techniques. Annealing furnaces and thermal evaporators. Materials Characterization Facilities with Bruker EMX EPR spectrometer with 10 GHz microwave bridge. Oxford Instruments ESR900 Continuous Flow Cryostat APD Closed Cycle Low Temperature System. Senteck 400 single-wavelength Ellipsometer. Philips Thin film X-ray diffractometer. Micro-Raman and Photoluminescence spectroscopy for thin films. Nanoindentation facility with Atomic Force Microscopy. Veeco Explorer Atomic Force Microscope with liquid scanning capability. Keithley Model 82 CV measurement system; HP4284 LCR Meter Micro-scratch tester for thin film adhesion measurements. Romulus IV micro-scratch tester for thin film adhesion measurements. Quantum Design model MPMS-5S SQUID magnetometer, Lake Shore model 7000 ac susceptometers. Bruker Optics Tensor 27 FTIR spectrometer, CSM Instruments Nanotribometer and Fogale Microsurf 3D optical profilometer.

Other Equipment: Diamond anvil cells capable of generating multi-megabar pressures. Electric Discharge Machining of small holes down to 10 microns in diameter in metallic gaskets. Laser heating facility for samples in diamond anvil cells.

Laser and Nonlinear Optics Labs include Absorption spectroscopy performed with a Shimadzu UV-VIS-NIR double beam spectrophotometer UV 3101PC and with a cavity ring down spectrometer coupled to a tunable (200–1200 nm) alexandrite-LiF:F_2^+ color center laser (CCL) combination; Fluorescence and Raman spectroscopies centered around CCS-450 (Janis) closed cycle refrigerator system. Numerous pulsed and CW lasers can be configured for samples excitation. Among them, a Spectra-Physics model PA0270 injection seeded Nd:YAG laser with frequency doubling, tripling, and quadrupling coupled to MOPO System tunable over 400-2500 nm and two Light-Age Raman shifters (H_2 and D_2), and tunable (1100–1250, 550–600, 280–300 nm) LiF:F_2^- CCL; Light Age Alexandrite Laser System PAL101 with variable temporal and spectral outputs coupled to LiF:F_2^+ CCL (800–1200 nm) with frequency doubling, tripling, quadrupling and difference frequency generation (200–8000 nm); EKSPLA PL2143A high energy picosecond Nd:YAG; laser coupled to PG401 OPO tunable over 400–2100 nm 500 Hz repetition rate 1 mJ diode pumped Nd:YAG laser "PULSAR 200" with a pulse duration of 1.5–2 ns with frequency doubling and tripling option. CW lasers include, Coherent Argon and Krypton lasers, Lexel Ti-sapphire laser, SDL824 tunable diode laser, several external cavity multi-wavelength diode lasers, Er-fiber 1550 nm, 10 W linearly polarized ELD laser (IPG Photonics), and several home made Er fiber laser pumped microchip and external cavity mid-IR (2–3 μm) tunable lasers based on Cr_2^+:ZnS and ZnSe lasers with record (up to 6W) continuous wave output power. The Labs are equipped with state-of-the-art Raman/AFM/NSSOM system for fundamental studies and characterization of materials at nanoscale using Raman, Fluorescence, chemical imaging, as well as topographic, electrical and thermal platforms integrated in one instrument. we also equipped with several spectrometers/spectrographs for measuring fluorescence, excitation, and Raman spectra and kinetics of fluorescence. These include the portable Ocean Optics R2000 fiber coupled Raman system and several Acton Research Corp. SpectraPro scanning monochromators/imaging spectrographs-(SpectraPro 750, 500, 150) with gratings covering UV (200 nm)-middle IR (14000 nm) spectral range coupled to two Princeton Instruments ICCD. Other detectors include numerous PMTs, TE-cooled PbS and InGaAS detector for the 0.7–3 μm range, and a LN-cooled HgCdTe and fast InSb detectors for the 2–14 and 2–5 μm range, respectively. Data acquisition is performed with ARC NCL Spectral Management System, two Standford Instrument boxcar-averages and EGG Instruments 7265 lock-in amplifier interfaced with PC. There is extensive equipment for Z-scan and DFWM characterization of nonlinear optical materials. Spiricon LBA 100 beam profiler is available for beam diagnostics and Wavemeter W-4500 (Burleigh) system for wavelength measurements.

Table B—Appointments to Graduate Students, 2007–08

Title of Appointee	Appointments		Academic Load Allowed in Credit Hours	Hours of Service Per Week	Stipend for Academic Year ($)
	Total	First year			
			Semester		
Teaching Assistant	11	5	9	20	20,500[1]
Research Assistant	11	1	6–9		20,000–22,175
Fellowship	5	1	8–12	0	16,000–20,770[2]
Total	27	7			

[1]The department pays tuition, fees, and health insurance for Teaching Assistants.
[2]Fellowships pay full tuition, fees, health insurance, and provide an education budget.

5. Personnel Engaged in Separately Budgeted Research, 10/07–9/08

Professorial faculty	14
Postdoctoral Associates	3
Graduate students	10
Nonteaching Research Personnel	4
Total	31

6. Separately Budgeted Research Expenditures by Source of Support*

	Departmental Research
Federal government	$2,344,888
State and local government	559,572
Private/Industry	190,139
Total	$3,094,599

*For fiscal year Oct. 1, 2006 through Sept. 30, 2007.

Table C—Separately Budgeted Research Expenditures

Research Specialty	No. of Grants	Expenditures ($)*
Astrophysics	5	179,419
Condensed Matter Physics	26	1,383,720
Optics	13	906,507
Physics Education	7	624,953
Total	51	3,094,599

*For fiscal year Oct. 1, 2006 through Sept. 30, 2007.

FACULTY

Professors

Lawson, Chris M., Ph.D., Oklahoma State, 1981. Nonlinear optics; fiber optics; optical sensors; optical coherence imaging and tomography.

Mirov, Sergey B., Ph.D., Lebedev Physical Institute, Moscow, 1983. Experimental quantum electronics; solid state lasers; physics of color centers; laser spectroscopy.

Shealy, David L., Ph.D., Georgia, 1973. Chairman of the Department. Geometrical optics; laser beam shaping optics; radiative transfer; caustic and optical aberration theory.

Vohra, Yogesh K., Ph.D., Bombay, 1980. High pressure physics; synthesis and characterization of diamond crystals and thin films; nanostructured ceramic and polymeric biomaterials.

Wenger, Lowell E., Ph.D., Purdue 1975. Dean of the School of Natural Sciences and Mathematics. Synthesis and characterization of magnetic materials and nanostructures; superconductivity.

Zvanut, Mary Ellen, Ph.D., Lehigh, 1988. Electrical studies and EPR studies of insulators and semiconductors; microelectronics and optoelectronics.

Associate Professors

Camata, Renato P., Ph.D., California Institute of Technology, 1998. Synthesis and properties of metal and semiconductor nanoparticles; nanostructured materials; aerosol strategies in nanomaterials fabrication; pulsed laser deposition of thin films and nanostructured materials.

Gerakines, Perry A., Ph.D., Rensselaer Polytechnic Institute, 1998. Astrophysics; interstellar molecules; interstellar dust; laboratory astrophysics; infrared astrophysics; comets; planetary science; origin of life; observational astronomy.

Harrison, Joseph G., Ph.D., Wisconsin, 1981. Solid state theory; atomic and molecular physics; MRI modeling; chemical kinetics.

Kawai, Ryoichi, Ph.D., Waseda, 1985. Condensed matter theory; biophysics theory; materials physics theory; computational physics; complex systems.

Martin, James C., Ph.D., Georgia Tech., 1978. Conformations of biological macromolecules; laser light scattering; optical pattern recognition; Raman spectroscopy.

Nordlund, Thomas M., Ph.D., Illinois, 1977. Structural dynamics of DNA and proteins; protein-DNA recognition; picosecond fluorescence; laser tweezers; biomolecule-nanoparticle interactions.

Assistant Professors

Hilton, David J., Ph.D., Cornell University, 2002. Ultrafast spectroscopy, ultrashort pulse generations; ultrafast terahertz spectroscopy; correlated electron materials; superconductvity; high magnetic field spectroscopy; magnetic semiconductors; complex functional nanomaterials; materials in extreme environments.

Kapoor, Rakesh, Ph.D., Bombay, 1989. Biophotonics, biophysics; bioimaging; upconverting materials; biosensors and nanostructured biomaterials.

Stanishevsky, Andrei V., Ph.D., Belarus Acad. of Sciences, 1996. Focused ion beam micro- and nano-fabrication; inorganic thin films deposition, characterization, and application; cathodic arc plasma deposition; plasma-electrolytic treatment.

Research Associate Professor

Wills, Edward L., Ph.D., Virginia, 1968. Experimental nuclear physics; extraterrestrial Mössbauer spectroscopy.

Research Assistant Professors

Catledge, S. Aaron, Ph.D., Alabama at Birmingham, 1999. Materials Science. Synthesis and properties of nanostructured super-hard materials; Chemical vapor Deposition (CVD) of diamond films and novel nanostructured coatings for biomedical implants; composite scaffolds for tissue engineering; mechanical properties.

Tsoi, Georgiy, Ph.D., Ukraine Acad. of Sciences, 1984. Physics and mathematics. Physical and quantum electronics.

Instructor

DeVore, Todd, Ph.D., Alabama at Birmingham, 1999. Computational physics.

Mohr, Robert, Ph.D., Alabama at Tuscaloosa, 2001. Computational applications to theoretical astrophysical problems.

Professor Emeritus

Agresti, David G., Ph.D., Cal. Tech., 1967. Extraterrestrial Mössbauer spectroscopy, planetary science; Martian regolith; meteorites; origin of life; laser raman instrument development.

Bauman, Robert P., Ph.D., Pittsburgh, 1954. Infrared and Raman spectroscopy; molecular structure and interactions; teaching-learning principles; Piaget theory applied to the college student.

Young, John H., Ph.D., Clark, 1969, General relativity; electromagnetic theory.

Associate Professor Emeritus

Wdowiak, Thomas J., Ph.D., Case Western Reserve, 1971. Astrophysics; planetary science, including the surface exploration of Mars; Astrobiology; instrumentation for lander spacecraft; extrarrestrial Mössbauer and Raman spectroscopy; interstellar molecules; interstellar dust; laboratory astrophys-

ics; meteoritics; early solar system, infrared astrophysics; origin of life.

RESEARCH SPECIALTIES AND STAFF

Theoretical

Astrophysics. Computer modeling of astrochemical processes. Origin of the solar system, impact events. Agresti, Gerakines, Mohr, Wdowiak.

Biophysics. Macromolecular structure, assembly and dynamics by computer modeling. Kawai, Martin, Nordlund.

Condensed Matter Physics. Low-dimensional systems; defects in insulators and semiconductors; positron states in condensed-matter; simulation of chemical vapor deposition processes; computational electromagnetics; surface adsorption; *ab initio* molecular dynamics simulations; computational algorithms applicable to massively parallel computers; quantum monte carlo simulations; non-equilibrium statistical mechanics, stochastic processes. Camata, Harrison, Kawai, Mirov, Stanishevsky, Vohra, Zvanut.

Optics. Laser physics, laser spectroscopy, fiber, laser, soft x-ray/UV optics; geometrical optics; nonlinear optics; laser beam shaping; optical design; caustic and optical aberration theory. Lawson, Mirov, Shealy.

Experimental

Astrophysics. Astrochemistry of cosmic ices and complex interstellar molecules, molecular evolution and precursors of life, hydrothermal systems, instruments for in-situ planetary science and life search, participation in the Mars Exploration Rover missions, mass extinctions, and Precambrain paleontology, bringing to bear tools such as Mössbauer, uv/vis/ir, Raman, and mass spectroscopies, XRD, and chemical analysis. Agresti, Gerakines, Mohr, Wdowiak.

Biophysics & Biophotonics. DNA and protein structure and function via contiuous and time-resolved fluorescence spectroscopy and molecular calculations; fiber-optic biosensors; TIRF; FRET; transient kinetics of molecular interactions; energy transfer and photophysics of sunscreens; spectroscopy and imaging of assembly and interactions between biomolecules and nanoparticles. Kapoor, Nordlund.

Condensed Matter Physics. EPR studies of bulk crystals and thin films; optical Mössbauer effect; design and construction of portable Mössbauer spectrometer for use in extraterrestrial studies; high pressure physics; electrical studies of semiconducting and insulating materials; electrical, and optical properties of bulk synthetic diamond and diamond thin films, radiational defects in crystals, optical properties of laser crystals, time-resolved laser spectroscopy; synthesis and characterization of metallic, semiconducting and magnetic materials/nanostructures; superconductivity; aerosol strategies. Camata, Mirov, Stanishevsky, Tsoi, Vohra, Wenger, Zvanut. Three postdoctural associates.

Materials Science/Nanophysics. Nanostructured materials, carbon nanotube synthesis and properties, nanoscale direct writing and patterning, Nanocomposite Biomaterials. Camata, Catledge, Stanishevsky, Vohra, Wenger.

Optics. Laser optics; Laser resonators; Solid state laser materials, Tunable lasers, Laser spectroscopy; UV, holographic projection processing of materials; physiological optics; non-linear optics and nonlinear optical materials; diamond windows for optical spectroscopy; fiber optics; optical sensors; optical imaging; optical coherence; tomography. Lawson, Mirov, Shealy. One postdoctoral associate.

Physics Education. Bauman, DeVore, Martin, Wills, Young.

FACULTY PUBLICATIONS

Agresti, David

R. V. Morris, G. Klingelhöfer, D. G. Agresti, C. Schröder, D. Rodionov, A. Yen, D. Ming, and the Athena Science Team, ''Identification of iron-bearing phases on the martian surface and in martian meteorites and analog samples by Mössbauer spectroscopy,'' Lunar and Planetary Science 38, Paper No. 1881 (2007).

D. G. Agresti, M. D. Dyar, and M. W. Schaefer, ''Velocity scales for Mars Mössbgauer data,'' Hyperfine Interactions, 170, Nos. 1-3, 67-74 (2006).

D. G. Agresti, M. D. Dyar, and M. W. Schaefer, ''Velocity calibration for *in situ* Mössbauer data from Mars,'' Hyperfine Interactions, 167, Nos. 1-3, 845-850 (2006).

M. D. Dyar, D. G. Agresti, M. W. Schaefer, C. A. Grant, and E. C. Sklute, ''Mössbauer spectroscopy of earth and planetary materials, Annual Review of Earth and Planetary Science, **34**, 83–125 (2006).

Camata, Renato P.

H. Kim, R. P. Camata, S. Lee, G. S. Rohrer, A. D. Rollett, and Y. K. Vohra, ''Crystallographic Texture in Pulsed Laser Deposited Hydroxyapatite Bioceramic Coatings,'' Acta Materialia, **55**, 131-139 (2007).

M. M. Abbas, D. Tankosic, P. D. Craven, J. F. Spann, A. LeClair, E. A. West, J. C. Weingartner, A. G. G. M. Tielens, J. A. Nuth, R. P. Camata, and P. A. Gerakines, ''Photoelectric Emission Measurements on the Analogs of Individual Cosmic Dust Grains,'' The Astrophysical Journal **645**, 324-336 (2006).

H. Kim, R. P. Camata, S. Lee, G. S. Rohrer, A. D. Rollett, S. I. Bellis, Y. K. Vohra, ''Calcium Phosphate Bioceramics with Tailored Crystallographic Texture for Controlling Cell Adhesion'' in Mechanotransduction and Engineered Cell-Surface Interactions, edited by M. P. Sheets, J. T. Groves, D. Discher (Mater. Res. Soc. Symp. Proc. **925E**, Warrendale, PA, 2006), BB.2.7.

M. Bulut, R. P. Camata, ''A Generalized Cell Method for Hard Disk Molecular Dynamics Simulation of Polydisperse Systems,'' International Journal of Modern Physics C **18**, 1407–1416 (2007).

Catledge, Shane

S. A. Catledge, W. C. Clem, N. Shrikishen, S. Chowdhury, A. V. Stanishevsky, M. Koopman, and Y. K. Vohra, ''An electrospun triphasic nanofibrous scaffold for bone tissue engineering,'' Biomedical Materials (2007), in press.

S. A. Catledge, V. Thomas, and Y. K. Vohra, ''Effect of Surface Oxides and Intermetallics on Nanostructured Diamond Coating of Nitinol,'' Current Nanosciences **2**, 9 (2006).

Michael R. Hill, Shane A. Catledge, Valeriy Konovalov, William C. Clem, Shafiul A. Chowdhury, Brandon S. Etheridge, Andrei Stanishevsky, Jack E. Lemons, Yogesh K. Vohra, Alan W. Eberhardt, ''Preliminary tribological evaluation of nanostructured diamond coatings against ultra-high molecular weight polyethylene'', J. Biomed. Mater Res. B Appl. Biomater (2007), Sept. 12. [Epub ahead of print].

S. A. Catledge, V. Thomas, and Y. K. Vohra, ''Effect of Surface Oxides and Intermetallics on Nanostructured Diamond Coating of Nitinol'', Current Nanosciences **2**, 9 (2006).

Gerakines, Perry

Whittet, D. C. B., Shenoy, S. S., Bergin, E. A., Chiar, J. E.,

Gerakines, P. A. Gibb, E. L., Melnick, G. J., Neufeld, D. A., ''The abundance of carbon dioxide ice in the quiescent intracloud medium,'' Astrophysical Journal **655**, 332-341 (2007).

Abbas, M. M. Tankosic, D., Craven, P. D., Spann, J. F., LeClair, A., West, E. A., Weingartner, J. C., Tielens, A. G. G. M. Nuth, J. A. Camata, R. P. Gerakines, P. A., ''Photoelectric emission measurements on the analogs of individual cosmic dust grains,'' Astrophysical Journal **645**, 324-336 (2006).

P. Sonnentrucker, D. A. Neufeld, P. A. Gerakines, E. A. Bergin, G. J. Melnick, W. J. Forrest, J. L. Pipher, and D. C. B. Whittet, ''Fully Sampled Maps of Ices and Silicates in Front of Cepheus A East with Spitzer'', Astrophysical Journal **672**, 361–370 (2008).

Kapoor, Rakesh

V. Nardone and R. Kapoor, ''Highly sensitive evanescent wave combination tapered fiber optic fluorosensor for protein detection.'' Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications VIII, 685203, SPIE Proceedings **6852** (2008).

K. Sun and R. Kapoor, ''Optimum taper length for maximum fluorescence signal from an evanescent wave fiber optic biosensor.'' Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications VIII, 68520U, SPIE Proceedings **6852** (2008).

Kawai, Ryoichi

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