Tab 4

LETTER OF INTENT TO ENTER INTO A SUBAWARD AGREEMENT

(with an entity that is eligible to receive federal awards under OMB Circular A-110)

Title of Application: Ground-Based Studies in Neurobehavioral Biology

Prime Institution: McClean Hospital

Project Director / Principal Investigator: Jack Bergman, Ph.D.

SubAward Institution: Trustees of Boston University / Boston University Medical Campus

BUMC-Principal Investigator: [redacted]

Total Direct and Indirect Costs (Current Year): $ 225,156 (to BU)

Total Direct and Indirect Costs (Total Project): $ 712,655 (to BU)

Proposed Effective Dates (Total Project):
From: 1-15-10 To: 1-14-14

DHHS F&A Agreement, BUMC. Date: February 10, 2009 Rate: 62.5% (on-campus)

DUNS No: 604483045 EIN No: 1042103547A1

Human Subjects: ☐ *Yes* x *No* ☐ *Pending* ***Animals***: ☐ *Yes* X *No* ☐ *Pending*

Assurances/Certifications: The following assurances/certifications are made and verified by the signature of the Official Signing for the Cooperating Institution. Human Subjects; Vertebrate Animals; Debarment and Suspension; Drug-Free Workplace; Lobbying; Delinquent Federal Debt; Research Misconduct; Civil Rights (Form HHS 441 or HHS 690); Handicapped Individuals (Form HHS 641 or HHS 690; Sex Discrimination (Form HHS 639-A or HHS 690); Age Discrimination (Form HHS 680 or HHS 690); Financial Conflict of Interest.

The appropriate program and administrative personnel of each institution involved in this grant application are aware of the National Institutes of Health consortium grant policy and are prepared to establish the necessary inter-institutional agreement consistent with the Guidelines for Establishing and Operating Consortium Grants (January, 1989).

Trustees of Boston University
Boston University Medical Campus

By: [signature]
Date: 12/18/08

[redacted]

Boston University Medical Campus
85 East Newton Street, M-921
Boston, MA 02118

[redacted]

Boston University Investigator

By: [signature]
Date: December 2008

BUMC Principal Investigator

BOSTON UNIVERSITY SCHOOL OF MEDICINE

Proposed Scope of Work

The Molecular Aging and Development Laboratory at Boston University School of Medicine under the leadership of [redacted] will be responsible for the *in vivo* Quasi-elastic Light Scattering (QLS) experiments in conjunctions with a coordinate NASA-funded study at McLean Hospital, Belmont, MA. The proposed research program studies will be conducted in collaboration with Jack Bergman, Ph.D. and [redacted] Ph.D. McClean Hospital, Harvard Medical School.

Name	Object Code	Role on Project	Key Personnel	% Effort	Cal months	Base Salary	Year 2 3% Increase	Year 3 3% Increase	Year 4 3% Increase	Year 1 Proposed Budget	Year 2 Proposed Budget	Year 3 Proposed Budget	Year 4 Proposed Budget	TOTALS
[redacted]	0900	PD/PI	Y	0.05	0.60	160,000	164,800	169,744	174,836	8,000	8,240	8,487	8,742	
	0900	Sr Postdoc	Y	0.20	2.40	46,992	48,402	49,854	51,349	9,398	9,680	9,971	10,270	
	0900	Jr Postdoc		0.20	2.40	39,360	40,541	41,757	43,010	7,872	8,108	8,351	8,602	
Research Technician	0900	Technician		0.50	6.00	38,000	39,140	40,314	41,524	19,000	19,570	20,157	20,762	
[redacted]	0902	Graduate student		0.20	2.40	28,000	28,840	29,705	30,596	5,600	5,768	5,941	6,119	
Sub Total Salaries										49,870	51,367	52,908	54,495	208,639
		Bench FTE =		1.10										
Fringe Benefits	0955													
BL Fringe Rates														
		0.267								6,742	6,950	7,158	7,373	
		0.234								4,446	4,579	4,717	4,858	
Sub Total Fringe Benefits										*11,193*	*11,529*	*11,875*	*12,231*	46,828
Sub Total Personnel Costs										**61,064**	**62,896**	**64,782**	**66,725.841**	**255,467**
Capital Equipment	0910													
Customized Q-S instrument														
SEPIA - Mainframe for diode laser system incl. power supply and safety interlock						1	8,000	8,000						
89279-0 SLM 808 G Laser driver module for SEPIA models, laser head types "PDL 800-B", including gating option						2	3,125	6,250						
89279-0 SOM 808 Oscillator module for SEPIA systems (2.5 to 40 MHz)						1	2,500	2,500						
780 laser head with integrated collimator and TE cooler for temperature stabilization						2	6,500	13,000						
PC computer for Q-S setup								0		36,750				
						6		29750		**29,750**		**0**	**0**	29,750
Consultant														
[redacted]														
Software Consultant									1200 per month	10,000	10,000	10,000	10,000	
										14,400	14,400	14,400	14,400	
										24400	**24400**	**24400**	**24400**	
Lab Supplies	0924													
Electronics, optics, mechanical, laser parts														
Sub Total Lab Supplies										30,986	8,904	7,018	5,074	51,982
										30,986	**8,904**	**7,018**	**5,974**	51,982
Travel	0918													
Meetings (Scientific)														
Sub Total Travel										2,000	2,000	2,000	2,000	
										2,000	**2,000**	**2,000**	**2,000**	8,000
Other Expenses														
Shipping and Postage	0935													
Publication costs (paper) and poster printing	0956									800	800	800	800	3,200
Sub total other expenses										1,000	1,000	1,000	1,000	
										1,800	**1,800**	**1,800**	**1,800**	7,200
Total Direct Costs										150,000	100,000	100,000	100,000	TDC Tot = 449,966
Modified Total Direct Costs										120,250	100,000	100,000	100,000	MTDC Tot = 420,249
Total Indirect Costs										75,156	62,500	62,500	62,500	IDC Tot = 262,656
Total Budget		0.625								**225,156**	**162,499**	**162,501**	**162,500**	Tot Cost = 712,655

BUDGET JUSTIFICATION

Personnel

[redacted], *(Principal Investigator,* Boston University, 0.6 cal) [redacted] Boston University School of Medicine, College of Engineering, & Photonics Center. Dr. Goldstein is *Associate Professor in Psychiatry, Neurology, Ophthalmology, Pathology & Laboratory Medicine* at the School of Medicine; *Associate Professor in Biomedical Engineering* at the College of Engineering; and *Faculty Member* at the BU Photonics Center. [redacted] has over two decades of experience in basic science biomedical research with a strong interest in and focus on molecular pathophysiology and translational research. He conducted postdoctoral research focusing on Alzheimer's disease with [redacted], at the Massachusetts General Hospital, Harvard Medical School, and in lens biology with [redacted], at the Brigham and Women's Hospital, Harvard Medical School. He has received honors from numerous organizations, including the Optical Society of America (Plenary Speaker, 2006), American Federation for Aging Research, Alzheimer's Association, National Institute of Mental Health, National Institute on Aging, World Congress on Stress Research, and Harvard Medical School. [redacted] will be responsible for the overall coordination and execution of the Project. He will regularly liase with [redacted] and participate in the day-to-day execution and technical oversight of all aspects of the research program. He will assume responsibility for data collection, organization, analysis, presentation and publication.

[redacted] (2.4 cal) is *Senior Postdoctoral Research Fellow* at the Molecular Aging & Development Laboratory at Boston University. [redacted] is a primary contributor in the development, application, and testing of the first generation QLS instruments for non-invasive *in vivo* quantitative assessment of molecular pathology in the lens of the eye. [redacted] received [redacted] doctoral degree (Ph.D., Neuroscience, Imperial College, London) in 2004 while working in the laboratories of Drs. S.M. Gentleman and L.S. Jen. She has extensive (>8 years) experience with and expertise in handling and manipulating laboratory animals and is the most skilled operator of the suite of purpose-built ophthalmic instruments used in the laboratory. [redacted] has been a member of [redacted] laboratory for 5 years and has concentrated her effort towards development of QLS instrumentation and data analyses of Aβ in lens and brain. She will participate with [redacted] and [redacted] in the day-to-day research activities of the proposed grant and will work with [redacted] to execute and complete the project aims. [redacted] will participate in data organization, [redacted] (2.4 cal) is *Postdoctoral Research Fellow (Laser Physics-Optics)* at the Molecular Aging & Development Laboratory at Boston University School of Medicine. [redacted] received her doctoral degree in Physics (2009) from the prestigious Moscow State Pedagogical University. Her research interests include non-equilibrium phenomena in superconducting single-photon detectors and new applications of autocorrelation spectroscopy. In addition to her strong training in theoretical physics, [redacted] is an accomplished experimentalist with a vast technical skill set that is ideally suited to the proposed project featuring non-invasive infrared quasi-elastic light scattering (QLS) autocorrelation spectroscopy. [redacted] will be responsible for evaluating the theoretical and empirically derived mathematical models incorporating the QLS output of the proposed study. [redacted] will also be responsible for analytical algorithm evaluation, including programming, instrument-operator interface optimization, and ongoing instrument performance evaluation. [redacted] will be responsible for all optics and laser physics aspects of the proposed project, including laser and optical alignment, QA/QC assessments, and output analyses. She will participate with [redacted] in the day-to-day research activities of the proposed grant and will work with [redacted] and other study personnel to execute and complete the project aims. [redacted] will participate in the analysis, presentation, and publication of the study results.

Research Technician, B.Sc., (6 cal) at the Molecular Aging & Development Laboratory at Boston

University. The Senior Research Technician will be an experienced biomedical research technician with expertise in handling small laboratory animals. The Research Technician will perform the *in vivo* experiments under the guidance of [redacted] The Research Technician will also perform postmortem tissue procurement, ocular dissection, and *ex vivo* lens phenotyping using a Zeiss-Urban slit lamp stereophotomicroscopy imaging rig (under the guidance of [redacted]). The Research Technician will also prepare samples for biochemical analysis and project-relevant assays. The Research Technician will work with [redacted] to execute the proposed study aims and assist with laboratory work and data acquisition.

[redacted] (2.4 cal) is a Biomedical Engineering graduate student working at the Molecular Aging & Development Laboratory at Boston University School of Medicine. [redacted] obtained his B.S from Drexel University, where he worked in the Alzheimer's disease laboratory of Dr Aleister Saunders. [redacted] has expertise and wide ranging experience in biomedical research involving molecular biology techniques. [redacted] will assist [redacted] will participate in the organization, analysis, presentation, and publication of the study results.

Consultants:

Senior Ophthalmic Instrumentation Consultant

[redacted] (Senior Laser Physicist & Optical Consultant) is *Associate Professor* in the Departments of Ophthalmology & Dermatology, Harvard Medical School; *Senior Research Scientist,* Wellman Laboratory of Photomedicine, Massachusetts General Hospital; and *Distinguished Professor of Physics & Photonics*, Boston University Photonics Center. [redacted] is an internationally recognized physicist and optical design innovator. He is a pioneering figure in confocal microscopy, ophthalmic instrument design, and biomedical applications of advanced laser technology [redacted] is the inventor of the scanning laser ophthalmoscope (SLO) for which he won the Optical Society of America's prestigious Edwin Land Medal in Optics in 1999. He has also developed advanced technology for retinal tracking, confocal ophthalmic biomicroscopy, spatially-resolved refractometry, flow cytometry, ocular wavefront aberrometry, and other lead-edge optical instrumentation. [redacted] has made seminal contributions to the development of both confocal microscopy and flow cytometry. He invented and developed the scanning laser ophthalmoscope in the early 1980s. His VivaScope (Lucid, Inc.), a widely used confocal microscope for non-invasive tissue imaging that obviates invasive biopsy, continues to generate >300 scholarly articles each year [redacted] current research focuses on new applications of confocal microscopy, advanced ophthalmologic optics, flow cytometry, high brightness LEDs, and adaptive mirrors. [redacted] splits his time between the Wellman Laboratory for Photomedicine, Massachusetts General Hospital, and the Boston University Photonics Center, where he is an integral member of the [redacted] team. He has been working closely with the team for the past two years to design and develop non-invasive correlational spectroscopy instrumentation for Alzheimer's disease. [redacted] responsibilities on this project focus on instrument design and testing and interpretation of QLS data acquired. He will participate in data analysis and publication of the project results.

Software Consultant

TBA

A software consultant is needed for assistance in software issues and data analysis for the QLS instrument and data collection.

Capital Equipment

In Year 1 only, we are requesting funds for the fabrication of a dedicated QLS instrument from PicoQuant.

The purchase of this item is a total of $29,750

Supplies

We have budgeted $30,986 in Year 1; $8,904/ in Year 2; $7,018 in Year 3; $5,074 in Year 4 for total supplies. These costs include the purchasing of electronics, optics, mechanical, and laser parts. The majority of this allocation is budgeted for Yr1 when the QLS instrument is to be fabricated and for which the parts are necessary.

Consultant Costs

We request $ 10,000/yr in consultancy fees for [redacted] (Harvard Medical School; Wellman Laboratory for Photomedicine, Massachusetts General Hospital) and $ 12,000/yr in consultancy fees for a software consultant. *Please see descriptive biography above.*

Travel

We request $2,000/Yr for travel expenses to enable [redacted] to present at a relevant scientific conference.

Other Expenses

We request $800/Yr for shipping and postage costs associated with this project. We budgeted another $1000/Yr for publication/presentation costs.

Selected Relevant Equipment – Boston University

Selected Ultra-Trace Elemental and Isotopic Analytical Equipment: NIH-NCRR funded Element-XR high-resolution magnetic sector field inductively-coupled plasma mass spectrometer (Thermo Scientific, Waltham, MA) with custom-coupled autosamplers, nebulisers, and membrane desolvators (Elemental Scientific Inc, Omaha), NesLab autochiller, and high-voltage power conditioner. This state-of-the-art purpose-adapted instrument is the most powerful and versatile instrument available for definitive high-resolution ultra-trace elemental and isotopic analyses and is the only such shared analytical resource of its kind in the nation dedicated to biometallomics. Selected allied equipment: CETAC UV-laser ablation solid sampling platform (CETAC Technologies), SMART Vibration Damping Tables (Newport), tunable femto-second Ti:Sapphire laser system with "Tsunami" (700-900nm) oscillator (Spectra Physics) pumped by a 10W Verdi-10 laser (Coherent Laser) (courtesy Boston University Photonics Center). The CBM is supported by a newly commissioned state-of-the-art sample preparation laboratory custom-designed for the facility. Dedicated equipment includes: customized HEPA-filtered (Class 100) metal-free plastic chemical fume hood (Plastic Concepts) for ultra-trace specimen preparation; HEPA-filtered horizontal laminar flow hoods (Class 100) for standard sample preparation; Ethos-EZ Microwave Digestion Labstation (Milestone) with microsampler and high-purity (ultra-trace) rotors for standard and high-pressure digestion; DMA-80 direct mercury analyzer and quartz sample cuvettes (Milestone) for high-throughput analyses, Mettler XS205 analytical balance with marble analytical weigh table, dedicated Millipore Element-Plus ultra-trace gradient water purification system, routine microscopes (Nikon, Zeiss) with full sets of plan apo objectives and accessories, analytical centrifuges and rotors, laser table for hyphenated optical rigs, drying oven, muffle furnace, ultrasonicator, analytical pipettes, and NIST-certified elemental analytical standards. The CBM is a restricted-access laser laboratory with electronic passcard protection.

Selected Lasers and Optical Equipment: Vibration isolation tables (TMC), computerized SMART vibration damping tables (Newport), 628 nm He-Ne laser (Newport), 540 nm He-Ne laser (Newport), 405 nm solid state laser (Crystal Lasers), 780 nm diode laser (Melles Griot), Avalanche photodiode detectors with power supplies (Perkin-Elmer), custom-built quasi-elastic light scattering instruments and accessories (Neuroptix), silicon detector (ThorLabs), mini-spectrometer (Ocean Optics), 100 ns autocorrelators (Correlator.com), Gentec power meters, 100 Mhz digital oscilloscopes (Tektronix), optomechanical hardware, wide range of mounted and unmounted optical elements (lenses, polarizers, attenuators), optomechanical components, accessory rigging.

Selected Microscopy and Imaging Instruments: Nikon 80i Eclipse fluorescence microscope with full set of dry and oil Nikon CFI plan apo objectives, EXFO X-Cite Fluorescent Lamp (Nikon), Spot RT Slider digital cameras (Diagnostic Instruments), QColor-5 digital camera (Olympus), D70 digital cameras (Nikon), custom-adapted Zeiss-OpMi stereophotomicroscopes with slit-lamp rig and custom equipped Zeiss-Urban stereo beamsplitter assembly, Nikon FS2 slitlamps with custom-built digital stereovideography and fluorovideography rigs, Zeiss PM-III w/fluorescence, plan apo objectives, polarizers, accessories.

Selected Histopathology Equipment: RHS1 microwave tissue processor (Milestone Medical), two CM1850 cryostats (Leica Microsytems), RM2235 microtome (Leica Microsytems), RM2155 microtome (Leica Microsystems), Vibratome 1000 (Warner Instruments), Shandon embedding center (Shandon), Nemesis 7200 automated robotic immunostainer (Biocare), Baker Sterilgard biosafety cabinets (2). Shared: Benchmark XT automated robotic immunostainer (Ventana), Nexus automated robotic special stain system (Ventana), automated tissue processors, tissue grossing workstations. Additional clinical and veterinary histopathology instrumentation is available through affiliation with the Department of Pathology [redacted] and the Translation Core of the NIH/NIA-funded Boston University Alzheimer's Disease Center [redacted]

Computing and Image Analysis: MATLAB (MathWorks), Nikon NIS-Elements imaging software, SPOT digital imaging software, NTX data correlation acquisition program (Neuroptix), custom

autocorrelation and data analysis software packages, Dell Precision 690 workstations, Dell Dimension PC (5), Apple iMAC computers (5), Microsoft Office Professional and Adobe Creative Suite 3 (Illustrator, Photoshop, InDesign); Prism, SysSTAT, and SPSS statistical packages.

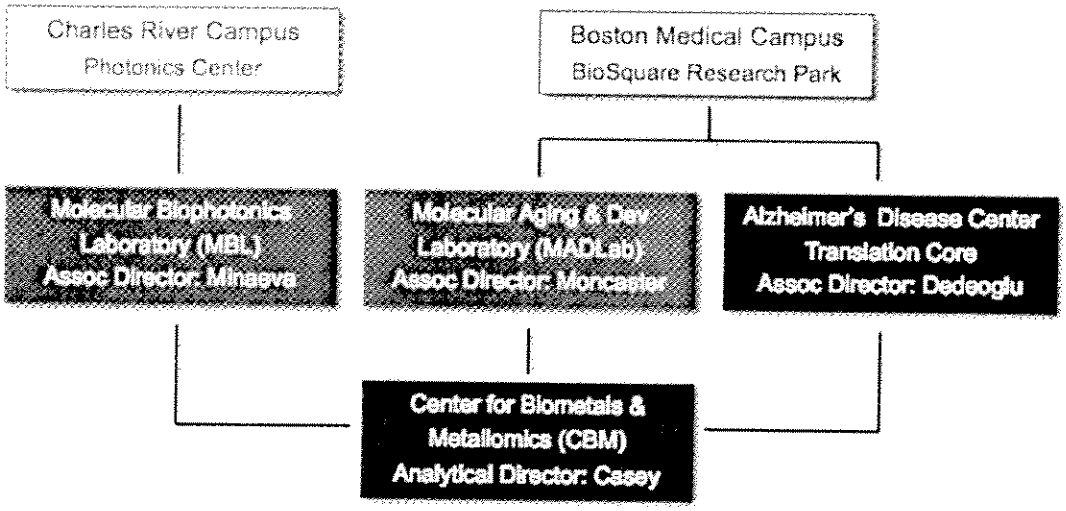
Selected Other Relevant Equipment: Amersham AKTA FPLC (GE Healthcare), Sterilgard biosafety cabinets (Baker), Synergy HT Microplate Reader (Biotek), ULT2186 -80°C freezers (3) (Revco), Refrigerators (2) (Fisher), Kelvinator -20°C freezer, water-jacketed incubators (Forma), Milli-Q water purifier (Millipore), Eppendorf 5810R refrigerated centrifuge, Beckman TL100 tabletop ultracentrifuge with various titanium rotors, benchtop microfuges (3), Sartorius 4-place digital analytical balances (2), Mettler 3-place digital balance (2), ultrasonic processor (Heat System), analytical osmometer (Advanced Instruments), electrophoresis apparatus and power supplies (3), dry transfer cell (Bio-Rad), temperature control water pumps (2) (Brinkman), 4-block thermal cycler (MJ Research).

Selected Other Shared Equipment (BU Photonics Center): Lightwave Converter; 1200-1600nm (Agilent), Optical Attenuator (Agilent), Multifunction Synthesizer (Agilent), Multimeter (Agilent), Optical Attenuator (Hewlett Packard), Digital Communications Analyzer (Hewlett Packard), Oxygen Analyzer (Illinois Instruments), Temperature Recorder (KIC Thermal Profiling), 2500 Dual Photodiode Meter (Keithley), Beam Condenser (Pike Technologies), Ionizing Air Blower, MUON Filter (North Coast Scientific Corp.), Bias Supply (North Coast Scientific Corp.), Fiber Optic Switch (Dicon Fiber Optics, Inc.), Stepper Motor Driver (National Instruments), Digital Controller (PI), Nitrogen Laser GL3300 (PTI - Photon Technologies International), Super Lume-X Xenon Lamphouse, Differential Electrical Digital Communications Analyzer (PX Instrument Technology), Optical Digital Communications Analyzer (PX Instrument Technology), Chiller for Sikama RC011 (Lytron), Proalign 5000 (EXFO AMERICA INC), Curing System/Light Delivery Module (EFOS), NovaCure IR (EFOS), Pulsed UV Curing System (Xenon Corporation), Spot Curing System (EXFO), Scientemp Freezer Chest (SCIENTEMP), Video Fiber Scope (Noyes Fiber Systems), Isotemp Oven (Fisher Scientific), Thermal Chamber, Laminar Flow Hood (Nuaire).

Facilities and Resources – Goldstein Laboratories at Boston University

[redacted]s Director of the four closely coordinated research facilities at Boston University:

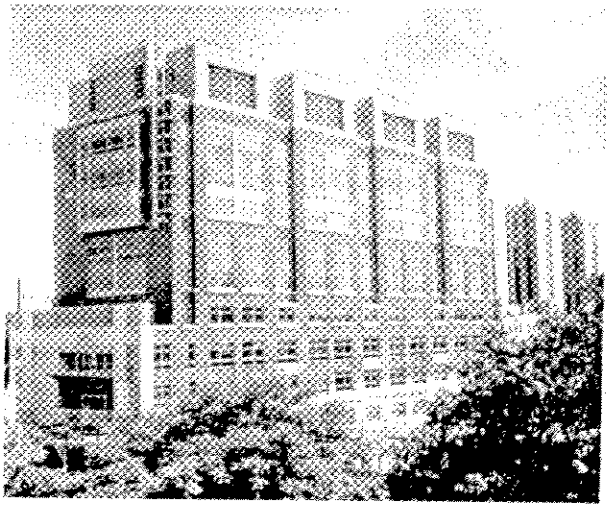
Molecular Aging & Development Laboratory	*Boston University School of Medicine*
Center for Biometals & Metallomics (CBM)	*Boston University School of Medicine*
Translation Core, NIH Alzheimer's Disease Center	*Boston University School of Medicine*
Molecular Biophotonics Laboratory	*Boston University Photonics Center*



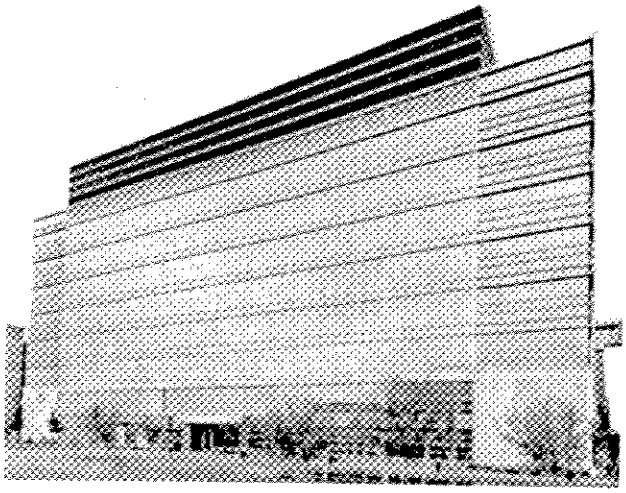
Molecular Aging & Development Laboratory

Boston University School of Medicine

The Laboratory (www.madlab.bu.edu) is located at the Biosquare Research Park, Boston's newest and largest biotechnology complex. This state-of-the-art research facility is centrally located on the Boston University Medical Center campus with access to the vast array of nearby research resources at Boston Medical Center and the School of Medicine. The Laboratory occupies 2665 sq. ft. of BL2+ certified research space encompassing five bays (1148 sq. ft.; 10 x 18 linear ft. lab benches), tissue culture facility (300 sq. ft.; 6 linear ft. lab bench), microscope room (250 sq. ft.; 15 linear ft. lab bench), a specialty histopathology suite (300 sq. ft.; 14 linear ft. lab bench), and state-of-the-art laser laboratory (465 sq. ft.; 18 linear ft. lab bench) for animal studies. Dedicated resources include a conference room, three adjacent private offices, reception area, administrative cubicles, shared office space, and utility service areas. Through affiliation with the Department of Pathology, lab personnel have access to a wide array of departmental resources in the building and across the campus.



Boston University Photonics Center

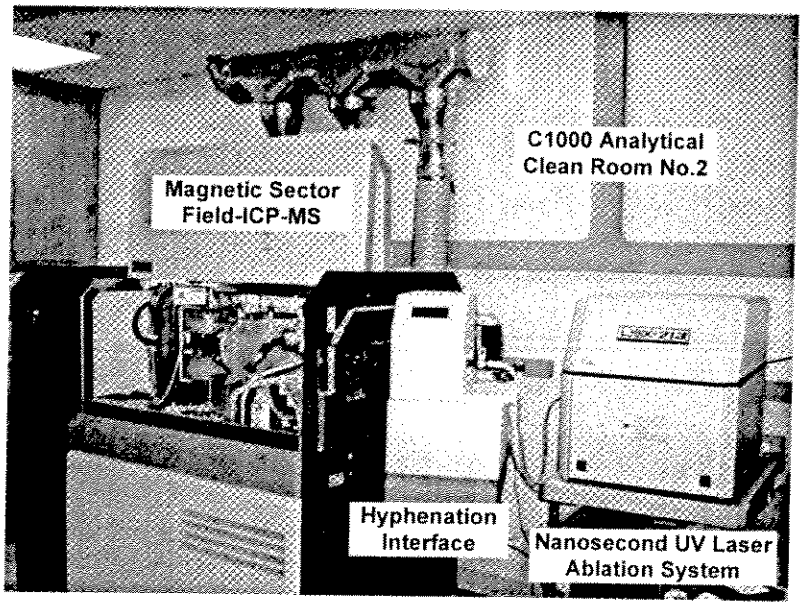


BioSquare Park–Boston Medical Center

Center for Biometals & Metallomics (CBM)
Boston University School of Medicine

The NCRR/NSF-funded Center for Biometals & Metallomics [redacted] is a new state-of-the-art analytical resource facility at the Boston University School of Medicine. This shared analytical facility is dedicated to interdisciplinary biomedical research requiring state-of-the-art ultra-trace elemental and isotopic analyses. Bioanalytical capabilities include definitive multi-elemental and isotopic identification (mass resolution >0.001 amu) across the periodic, absolute resolution of polyatomic interferences, ultra-trace quantitation across wide concentration range (from mg/L to sub-pg/L), high-resolution elemental tissue mapping, and custom elemental and isotopic analyses. The CBM is the first and only dedicated resource of its kind in the nation dedicated to ultra-trace elemental and isotopic analyses involving biological samples of biomedical significance. Core technology includes a state-of-the-art magnetic sector field inductively coupled plasma mass spectrometer (Element-XR, Thermo Scientific, Waltham, MA), hyphenated laser ablation system (Spectra Physics, CETAC), and C1000-certified analytical clean rooms.

The facility is located in the newest research building (BioSquare Research Park, 670 Albany Street) on the Boston University Medical Center campus. *NB: The CBM is closely affiliated and actively collaborates with the NCRR-sponsored National Mass Spectrometry Resource for Biology and Medicine* [redacted] *located one floor directly above the CBM.* The CBM is easily accessible to the large number of biomedical researchers on campus and is conveniently located to nearby transportation arteries and public parking for off-campus users. The CBM occupies two new interconnected Class 100 clean rooms with a dedicated air handling system that provides a climate-controlled cascading positive-pressure HEPA-filtered analytical environment. The CBM incorporates design principles successfully used in analytical clean room laboratory facilities at the Harvard School of Public Health, Ohio State University, Woods Hole Oceanographic Institution, and US Geological Survey. The CBM climate control system maintains a tightly controlled temperature (±1°F) and humidity (>30%) environment designed to house the Element-XR and allied analytical instrumentation. Active pressure sensors monitor positive static pressure drops between the preparative and analytical clean rooms. A variable frequency drive air regulator maintains non-fluctuating air pressure throughout the facility. Airflow to the CBM is serviced by a dedicated HVAC system with independent ducting from source to terminus. Heating, cooling and humidification coils, filter series (30% pre-filters, carbon fiber filters, 95% filters) provides 5000 cfm air-handling capacity. HEPA filter banks at all duct termini guarantee high-purity dust-free air supply throughout the analytical environment. [redacted] directs the CBM. [redacted], an experienced analytical chemist with expertise in ultra-trace elemental analyses, oversees analytical operations and management of the facility. [redacted] is assisted by an experienced technical staff with expertise in analytical chemistry, laser physics, and advanced histotechnology.



Center for Biometals & Metallomics (CBM), Boston University School of Medicine. Analytical clean room, magnetic sector field high-resolution ICP-MS elemental analysis instrument (Element-XR, ThermoElectron) and hyphenated custom femtosecond laser ablation platform.

Molecular Biophotonics Laboratory (MBL)
Boston University Photonics Center

This newly renovated state-of-the-art laser laboratory is located on the fifth floor of the Photonics Center in the Engineering Complex on the Charles River Campus at Boston University. The Photonics Center is devoted to translational development of laser-based diagnostic instruments. The Boston University Photonics Center (www.bu.edu/photonics) occupies a 10-story building devoted solely to lead-edge laser and photonics research and development. The Center houses ten floors of state-of-the-art research laboratories, research support space, a technology incubator, and instructional and seminar facilities specially designed for the development of photonic systems. The Center also has a number of unique shared facilities, including the Optoelectronics Processing Facility, the Precision Measurement Laboratory, and the Integrated Optics Laboratory. Senior Laboratory staff (including Dr. Goldstein) enjoy large private offices at the Center. Laboratory personnel have full access to all resources available at this unique facility.

Translational Core — NIH Boston University Alzheimer's Disease Center
Boston University School of Medicine

[redacted] was recently appointed Translational Core Director of the NIH-funded Boston University Alzheimer's Disease Center (www.bu.edu/alzresearch). The Center was established in 1996 and is one of an elite group of federally-funded Alzheimer's Disease Centers nationwide. Center operations are funded primarily by an Alzheimer's Disease Core Center (ADCC) grant from the National Institute on Aging. The Translational Core is a unique component of the Center and comprises an extensive transgenic mouse facility that provides established mouse lines and breeds new ones at no cost to affiliated researchers. The transgenic facility consists of two laboratories, three animal rooms, transgenic services (including genotyping), and veterinary support. This facility is a satellite of the Boston University Laboratory Animal Science Center (LASC), a fully accredited AAALAC animal care program. In addition to the transgenic mouse facility, the Translational Core also serves as a research resource for histopathology and neuropathology processing, microstereology, laboratory chemistry, genotyping, small animal MRI/PET imaging, and tissue banking.

Offices and Administrative Resources

[redacted] has two private offices, the first adjacent to the Molecular Aging & Development Laboratory on the Boston University Medical Campus and a second office across town at the Photonics Center on the Boston University main campus. Four additional private offices have been allocated for senior Laboratory personnel. All lab affiliated offices are fully supported with telephone, data ports, and secure high-speed secure wireless internet access through the Boston University telecommunications networks. [redacted] has access to email and postal services through Boston University resources and services on both campuses. The medical campus laboratory has a dedicated private conference room and an adjacent larger shared conference room, both of which are outfitted with the latest audiovisual and teleconferencing equipment. Access to larger shared conference rooms and lecture halls is available.

Computational Resources

Access to these resources is provided through the Scientific Computing and Visualization (SCV) group at Boston University. The SCV is located within the Office of Information Technology and provides specialized computing and communication resources to support of computational science and engineering, scientific visualization, computer graphics, and other disciplines that require high-performance computing services. The CBM and affiliated labs are heavy utilizers of this resource.

Other Relevant Research Resources

NCRR Mass Spectrometry Resource for Medicine & Biology: The NCRR-funded National Mass Spectrometry Resource for Medicine and Biology [redacted] operates state-of-the-art mass spectrometers, including a Bruker Reflex IV MALDI-TOF Mass Spectrometer and Micromass Quattro II Electrospray Triple Quadrupole Mass Spectrometer. The facility is fully

resourced to conduct all types of mass spectrometry and allied bioanalytical services and is located in the same building as the CBM. Both facilities are closely affiliated and actively engage in collaborative research efforts. **Confocal Laser Scanning Microscope Facility:** Major equipment includes a Zeiss LSM510 system, Axiovert 100M inverted microscopes, advanced digital photo-microscopy resources, computer-assisted image capture and analysis systems, and expert technical support personnel. **Electron Microscope Facility:** Includes a new computer-controlled Philips CM12 high-vacuum electron microscope operated in a specialized dry-room environment.

BIOGRAPHICAL SKETCH

[redacted]

eRA COMMONS USER NAME (credential, e.g., agency login)

LEG123

Associate Professor

Psychiatry, Neurology, Ophthalmology, Pathology & Laboratory Medicine, and Biomedical Engineering

Boston University School of Medicine
Boston University College of Engineering
Boston University Photonics Center

EDUCATION (INSTITUTION AND LOCATION)	DEGREE(S)	AWARDED	FIELD(S) OF STUDY
Columbia University, New York City	BA	1982	Humanities, Biology
Yale University, New Haven	MD, PhD	1994	Medicine, Neuroscience
Massachusetts General Hospital, Boston	Clinical Fellow	1999	Psychiatry
Massachusetts General Hospital, Boston	Research Fellow	1999	Psychiatry

A. Positions and Honors

Positions

1993-1994 March of Dimes Fellow, Yale University School of Medicine, New Haven.
1994-1995 Research Fellow, ADRC, McLean Hospital, Harvard Medical School.
1994-1995 Clinical Fellow (Internal Medicine, Mt. Auburn Hospital, Harvard Medical School.
1995-1999 Clinical Fellow (Psychiatry), Massachusetts General Hospital, Harvard Medical School.
1997-2000 Research Fellow, Genetics & Aging Res Unit, Mass General Hospital, Harvard Medical School.
1999-2000 Instructor in Psychiatry, Harvard Medical School.
1999-2003 Geriatric Psychiatrist, Massachusetts General Hospital, Boston..
1999-2002 Deputy Director, Laboratory for Oxidation Biology, Massachusetts General Hospital.
2000-2006 Associate Director, Center for Ophthalmic Research, Brigham & Women's Hospital.
2001- Founding Scientist & Director, Scientific Advisory Board, Neuroptix Corp, Acton, MA.
2001-2007 Assistant Professor in Psychiatry, Harvard Medical School.
2001-2007 Director, Molecular Aging & Development Laboratory, Brigham & Women's Hospital.
2001-2007 Director, Center for Biometals in Medicine (CBM), Brigham & Women's Hospital.
2005- NIH Scientific Reviewer, Beeson Scholars in Aging Research (K08/K21) Awards.
2008- Associate Professor in Psychiatry, Boston University School of Medicine, Boston.
2008- Associate Professor in Ophthalmology, Neurology, Pathology & Lab Med, BU School Medicine.
2008- Associate Professor in Biomedical Engineering, Boston University College of Engineering.
2008- Faculty Member, Boston University Photonics Center, Boston.
2008- Director, Molecular Aging & Development Laboratory, Boston University School of Medicine.
2008- Director, Center for Biometals & Metallomics, Boston University School of Medicine.
2008- Director, Molecular Biophotonics Laboratory, Boston University Photonics Center.
2008- Member, Conflict of Interest Committee, Boston University, Boston.
2008- Director, Translational Core, NIH Boston University Alzheimer's Disease Center.
2009- Editorial Board, Journal of Medical & Biological Sciences.
2009- NASA Scientific Reviewer, Central Nervous System Risk Panel

Honors

1978 Macy Foundation Scholar, Columbia College of Columbia University.
1982 Phi Beta Kappa, Columbia University, New York City.
1982 Magna Cum Laude, Columbia College of Columbia University New York.
1984 NIH Medical Scientist Training Program (MD, PhD), Yale Medical School.
1994 Young Investigator Award, World Congress on Stress (Bethesda, MD).
1996 Outstanding Resident in Psychiatry, National Institutes of Mental Health (NIMH).
1997 Livingstone Award, Consolidated Departments of Psychiatry, Harvard Medical School.
1998 NARSAD Young Investigator Award, Nat'l Alliance Research on Schiz.& Affective Disorders.
1998 American Psychiatric Association Research Award Fellowship.
1999 Dupont-Warren Award, Consolidated Departments of Psychiatry, Harvard Medical School.
2000 Future Leader in Psychiatry Year Award, Emory University.
2001 Rappaport Neuroscience Research Scholar, Massachusetts General Hospital.
2003 Markey Alzheimer's Disease Career Development Award (K08), Nat'l Institute on Aging (NIA).
2004 Beeson Scholar in Aging Research, NIH & American Federation for Aging Research (AFAR).
2006 Plenary Speaker, Optical Society of America/Frontiers in Optics, Rochester, NY.
2007 Technology Initiative & Development Awards, Boston University College of Engineering.
2008 Session Chair, CNS Biomarkers, BIO-2008, San Diego, CA.
2009 Session Chair, CNS Biomarkers, BIO-2009, Atlanta, GA.

B. Peer-Reviewed Publications & Issued Patents

1. Rasmusson, A., [redacted] Bunney, B., & Roth, R. *The 5-HT1A agonist 8-OH-DPAT selectively activates the dopaminergic system in the rat prefrontal cortex: an in vivo microdialysis study in the freely moving rat.* Synapse 18(3):218-24 (1994).
2. [redacted], Rasmusson, A., Bunney, B., & Roth, R. *The NMDA glycine site antagonist (+)-HA-966 selectively regulates psychological stress-induced metabolic activation of the mesoprefrontal cortical dopamine but not serotonin systems: a behavioral, neuroendocrine, and neurochemical study in the rat.* J. Neurosci. 14(8):4937-50 (1994).
3. Leach, S., Modlin, I., [redacted], Ballantyne, G. *Laparoscopic local excision of a proximal rectal carcinoid.* J. Laparoendoscopic Surg. 4:65-70 (1994).
4. Krakauer, E., [redacted], Sernyak, M., Woods, S. *Schizophrenia and strabismus: possible interaction of prefrontal cortex, frontal cortical eye fields & vergence centers.* J. Nerv. Mental Dis. 183:662-3 (1995).
5. [redacted] Barker, M., Segall, F., Asihene, R., Balser, S., Lautenbach, D., McCoy, M. *New-onset seizures and transient SIADH associated with sertraline use.* Am. J. Psychiatry 153(5):732 (1996).
6. [redacted], Rasmusson, A., Bunney, B., & Roth, R. *Role of the amygdala in the coordination of behavioral, neuroendocrine, and prefrontal cortical monoamine responses to psychological stress.* J. Neurosci. 16:4787-98 (1996).
7. [redacted] Sporn, J., Kim, H., Brown, S., Finkelstein, J., Sachs, G., & Stern, T. *New-onset diabetes mellitus & diabetic ketoacidosis with olanzapine treatment.* Psychosomatics 40(5):438-443 (1999).
8. Huang X, Atwood CS, Hartshorn MA, Multhaup G, [redacted], Scarpa RC, Cuajungco MP, Gray DN, Lim J, Moir RD, Tanzi RE, Bush AI. *The Aß Peptide of Alzheimer's Disease Directly Produces Hydrogen Peroxide Through Metal Ion Reduction.* Biochemistry 1999; 38, 7609-7616.
9. Huang X, Cuajungco MP, Atwood CS, Hartshorn MA, Tyndall JD, Hanson GR, Stokes KC, Leopold M, Multhaup G, [redacted], Scarpa RC, Saunders AJ, Lim J, Moir RD, Glabe C, Bowden EF, Masters CL, Fairlie DP, Tanzi RE, Bush AI. *Cu(II) potentiation of Alzheimer Aβ neurotoxicity: Correlation with cell-free hydrogen peroxide production and metal reduction.* J. Biol. Chem. 1999; 274(52):37111-6.
10. Huang, X., Atwood, C.S., [redacted], Hartshorn, M.A., Saunders, A.J., Moir, R.D., Tanzi, R.E., and Bush, A.I. *Metal-catalyzed redox activity of Aß- the major source of amyloid-associated oxidative stress in Alzheimer's disease. In Alzheimer's Disease and Related Disorders* (ed., K. Iqbal, D.F. Swaab, B. Winblad and H.W. Wisniewski) John Wiley & Sons, Ltd 1999, pp.383-390. (11) Cremens, M.C., Goldstein, L., Gottlieb, G.L. Geriatric psychiatry. In Psychiatry: Update and Board Preparation (ed. T.A. Stern and J.B. Herman) McGraw-Hill, 2000, pp. 471-478.
11. [redacted] Leopold, M., Huang, X., Atwood, C., Hartshorn, M., Lim, J., Chylack, L.T., Jr., Bowden, E., Tanzi, R., & Bush, A. *The tryptophan metabolites 3-hydroxykynurenine and 3-hydroxyanthranilic acid generate hydrogen peroxide and promote alpha-crystallin protein polymerization through metal ion reduction.* Biochemistry 2000; 39(24):7266-75.
12. [redacted]. and Henderson, D. *Atypical Antipsychotic Agents and New-onset Diabetes Mellitus.* Primary Psychiatry 2000; 7(5):65-8.
13. Cuajunco, M.P, [redacted], Nunomara, A., Smith, M.A., Lim, J.T., Atwood, C.S., Huang, X., Farrag, Y.W., Perry, G., Bush, A.I. *Evidence that the ß-amyloid plaques of Alzheimer's disease represent the redox-silencing and entombment of soluble neurotoxic Aß by zinc.* J. Biol. Chem. 2000; 275(26):19439-42.
14. Bush, AI, Atwood, CS, [redacted] Huang, X, and Rogers, J. Could *Aβ and APP be antioxidants?* J. Alzheimer's Disease 2000; 2:1-7.
15. Cherny RA, Atwood CS, Xilinas X, Gray DN, Jones WD, McLean CA, Barnham KJ, Volitakis I, Fraser FW, Kim Y-S, Huang X, [redacted] Moir RD, Lim JT, Zheng H, Beyreuther K, Tanzi RE, Masters CL, Bush AI. *Treatment with a copper-zinc chelator markedly and rapidly inhibits ß-amyloid accumulation in Alzheimer's disease transgenic mice.* Neuron. 2001; 30(3):665-676.
16. Bush A.I. and [redacted] *Specific metal-catalysed protein oxidation reactions in chronic degenerative disorders of ageing: focus on Alzheimer's disease and age-related cataracts. Aging vulnerability: causes and interventions.* Eds: G. Bock, J. Goode. Novartis Symposium 2001, 235:26-43.
17. [redacted] Muffat JA, Cherny RA, Moir RD, Ericsson MH, Huang X, Mavros C, Coccia JA, Faget KY, Fitch KA, Masters CL, Tanzi RE, Chylack LT, Bush AI. *Cytosolic β-amyloid deposition & supra-nuclear cataracts in lenses from people with Alzheimer's disease.* Lancet. 2003;361(9365):1258-65.
18. Friedlich, AL, Huang, X, Nagano, S, Rogers, JT, [redacted] Bush, AI, Multhaup, G, Beyreuther, K, Stremmel, W, Bayer, T. *Importance of copper and zinc in Alzheimer's disease and the biology of amyloid-β protein and amyloid-β protein precursor.* Metal Ions and Neurodegenerative Disorders. Ed: P. Zatta. World Scientific Publishing, Co, Ltd, London, UK. 2003, 245-261.
19. Chylack L, Fu, L, Mancini, R, Rehrmann, M, Saunders, AJ, Konobka, G, Tian, D, Hedley-Whyte, ET, Folkerth, R, and [redacted] *Lens-epithelium-derived growth factor (LEDGF/p75) expression in fetal and adult human brain.* Exp. Eye Res 2004; 79:941-48.
20. Chang PY, Bjornstad KA, Rosen CJ, McNamara MP, Mancini R, [redacted], Chylack LT, Blakely EA. Effects of iron ions, protons and x rays on human lens cell differentiation. Radiat Res. 2005, 164(4):531-9.

21. Tucker S, Ahl M, Cho HH, Bandyopadhyay S, Cuny GD, Bush AI, [redacted] Westaway D, Huang X, Rogers JT. RNA therapeutics directed to the non coding regions of APP mRNA, in vivo anti-amyloid efficacy of paroxetine, erythromycin, and N-acetyl cysteine. Curr Alzheimer Res. 2006 Jul;3(3):221-7.
22. Bandyopadhyay S, [redacted] Lahiri DK, Rogers JT. Role of the APP non-amyloidogenic signaling pathway and targeting alpha-secretase as an alternative drug target for treatment of Alzheimer's disease. Curr Med Chem. 2007;14(27):2848-64.
23. Saha S, Guillily M, Ferree A, Lanceta J,Chan D, Ghosh J, Hsu C, Segal L, Rhagavan K, Matsumoto K, Hisamoto N, Kuwahara T, Iwatsubo T, Moore L, [redacted] Cookson M, Wolozin B. LRRK2 modulates vulnerability to mitochondrial dysfunction in C. elegans (accepted, J Neurosci).
24. Fu L, Mancini R, Lu S, Konopka G, Hooli B, Saunders AJ, Ericsson M, Smith B, Crosby K, Chylack LT, Folkerth RD, [redacted]. LEDGF/p75 Regulates Neuroepithelial Stem Cell Differentiation and Neuroglial Fate Determination (submitted).
25. Moncaster JA, Moir, RD, Fu L, Mocofanescu A, Lu S, Xu W, Chadwick O, Rogers JT, Arnett E, Ericsson M, Li JV, Klunk WE, mathis CA, Clark JI, Tanzi RE, [redacted] Early Detection of Alzheimer Disease Molecular Pathology By Non-Invasive Quasi-Elastic Light Scattering (submitted).
26. Moncaster JA, Pineda R, Moir RM, Lu S, Burton M, Ghosh J, Ericsson M, Soscia SS, Mocofanescu A, R. Folkerth R, Robb RM, Clark JI, Tanzi RE, Hunter DG, [redacted] Alzheimer's Disease β-Amyloid Deposition and Supranuclear Cataracts in Lenses from People with Down Syndrome (submitted).
27. Kirby JE, Soscia SJ, Tucker SM, Washicosky KJ, Burton MA, [redacted] Duong S, Tanzi RE, Moir RD. The Alzheimer's disease amyloid β-peptide is an antibiotic (submitted).

Issued U.S. Patents

[redacted] Chylack LT, Ocular diagnosis of Alzheimer's disease. U.S. Patent No. 6,849,249 (2005).
[redacted], *et al.*, Method diagnosing neurodegenerative condition. U.S. Patent No. 7,107,092 (2006).
[redacted] Bush AI, Identification of agents that inhibit cataracts. U.S. Patent No. 7,166,472 (2007).
[redacted], Chylack LT, Ocular diagnosis of Alzheimer's disease. U.S. Patent No. 7,297,326 (2007).

C. Active Research Support

R01 GM 75986 (NIGMS/NIH) [redacted] 06/01/05 – 05/31/10
Lens Beta-Amyloid: Biochemistry and Diagnostics
The goal of this project is to investigate the biochemistry of Alzheimer's disease Aβ in the lens.

NSF 0821304 (NSF/MRI) [redacted] 08/01/08 – 07/31/09
MRI: Laser Ablation System for Elemental Mapping by Hyphenated Sector Field ICP-MS
Major Research Instrumentation (MRI) grant for laser ablation system.

Ellison Foundation [redacted] 01/01/09 –12/31/09
Laser Eye Scanner for Early Detection of Alzheimer's Disease
Develop new molecular diagnostic technology for Alzheimer's Disease.

P30-AG13846 PI: Kowall 01/01/09 –12/31/09
NIA(NIH) [redacted]
Translation Core, Boston University Alzheimer's Disease Center (Core Director: L. Goldstein).

Army Research Laboratory PI: Bifano (BUPC) 07/01/09 – 6/30/10
ARL/DoD (Phase III Technology Award) [redacted]
RADSCAN: Phase III development of laser eye scanner for *in vivo* radiation biodosimetry.

Small Business Innovation Grant (SBIR) PI: Bergstein (Zoiray) 07/01/09 – 04/30/10
NIA/NIH [redacted]
Label-Free Protein Array for Alzheimer's Disease Detection and Monitoring
Development of label-free protein detection array platform technology for AD biomarker analysis.

DOE-PS02-08ER08 [redacted] 08/01/09 – 07/31/12
US Dept Energy/NASA
Non-Invasive Detection and Molecular Analysis of Early Low X-Ray Dose Effects to the Lens
Development of non-invasive in vivo laser technology for low-dose radiation biodosimetry.

ECCS-0901503 PI: Cho (UCF) 08/15/09 – 07/31/12
NSF [redacted]
Collaborative: Regenerative Nanosensors for Assessment of Oxidative Stress in Neurodegeneration
Development of novel nanosensor platform for quantitative assessment of reactive radical species.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
[redacted]	**Postdoctoral Researcher**
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Moscow State Pedagogical University, Moscow, Russia	B.S.	-2003	Physics
Moscow State Pedagogical University, Moscow, Russia	M.S.	-2005	Physics, Electronics
Moscow State Pedagogical University, Moscow, Russia	Ph.D.	-2009	Physics, Optics

A. Positions and Honors

Positions and Employment

2002 – 2006 Junior Researcher, Research and Educati on Radiophysics Center, Moscow State Pedagogical University
2006 – 2009 Research Scientist, Boston University, Department of Electrical and Computer Engineering
2009- present Postdoctoral Researcher, Boston U niversity, School of Medicine

Other Experience and Professional Memberships

2007-present Member, Optical Society of America
2007-present Member, SPIE

B. Selected Peer-Reviewed publications (5 most relevant)

1. [redacted] Cristian Bonato, Bahaa E. A. Saleh, David S. Simon and Alexander V. Sergienko, "Odd- and Even-Order Dispersion Cancellation in Quantum Interferometry", *Physical Review Letters*, 102, 100504 (2009).

2. Nishant Mohan, [redacted] Gregory N. Gol'tsman, Magued B. Nasr, Bahaa E.A. Saleh, Alexander V. Sergienko, and Malvin C. Teich "Photon-Counting Optical Coherence-Domain Reflectometry Using Superconducting Single-Photon Detectors", *Optics Express*, v. 16, pp. 18118-18130 (2008).

3. Magued B. Nasr, [redacted], Gregory N. Goltsman, Alexander V. Sergienko, Bahaa E. A. Saleh, and Malvin C. Teich "Submicron axial resolution in an ultrabroadband two-photon interferometer using superconducting single-photon detectors", *Optics Express*, v. 16, pp. 15104-15108, (2008).

4. Divochiy, F. Marsili, D. Bitauld, A. Gaggero, R. Leoni, F. Mattioli, A. Korneev, V. Seleznev, N. Kaurova, [redacted], G. Gol'tsman et al., "Superconducting nanowire photon number resolving detector at telecommunications wavelengths", *Nature Photonics*, Vol.2, pp. 302-306, (2008)

5. W. Slysz, M. Wegrzecki, J. Bar, M. Gorska, V. Zwiller, C. Latta, P. Bohi, I. Milostnaya [redacted] A. Antipov, O. Okunev, A. Korneev, K, Smirnov, B. Voronov, N. Kaurova, G. Gol'tsman, A. Pearlman, A. Cross, I. Komissarov, A. Verevkin, R. Sobolewski, "Fiber-coupled single-photon detectors based on NbN superconducting nanostructures for practical quantum cryptography and photon-correlation studies", *Appl. Phys. Lett.* 88, 261113 (2006).

Additional Relevant Publications

1. Milostnaya, A. Korneev, M. Tarkhov, A. Divochiy[redacted]. Seleznev, N. Kaurova, B. Voronov, O. Okunev, G. Chulkova, K. Smirnov, G. Gol'tsman, "Superconducting Single Photon Nanowire Detectors Development for IR and THz Applications", *J. Low Temp. Phys.*, 151, pp. 591–596 (2008).

2. M. Tarkhov, J. Claudon, J. Ph. Poizat, A. Korneev, A. Divochiy,[redacted]al., "Ultrafast reset time of Superconducting Single Photon Detectors", *Appl. Phys. Lett*, 92, 241112 (2008)

3. G. Gol'tsman[redacted] A.Korneev et al., "Middle-Infrared to Visible-Light Ultrafast Superconducting Single-Photon Detectors", *IEEE Trans. Appl. Supercond.*, 17, pp. 246-251 (2007)

4. A. Korneev,[redacted] A. Divochiy, et al., "Single-Photon Detection System for Quantum Optics Applications", *IEEE Journal of selected topics in quantum electronics*, Vol. 13, No. 4, pp. 944-951 (2007).

5. A. Korneev[redacted] I. Rubtsova, I. Milostnaya, G. Chulkova, B. Voronov, K. Smirnov, V. Seleznev, G. Gol'tsman, A. Pearlman, W. Slysz, A. Cross, P. Alvarez, A. Verevkin, R. Sobolewski, "Superconducting single-photon ultrathin NbN film detector", Quantum Electronics 35(8) 698-700 (2005)

C. Research Support

Not applicable

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
[redacted]	**Senior Postdoctoral Fellow**
eRA COMMONS USER NAME (credential, e.g., agency login)	
[redacted]	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Sheffield, United Kingdom	B.Sc.	1997-2000	Biomedical Science
Imperial College, London, United Kingdom	Ph.D.	2000-2004	Neuroscience
Imperial College, London, United Kingdom	Post-doc	2004-2004	Neuroscience
Harvard Medical School and Brigham & Women's Hospital	Post-doc	2005-2007	Surgery
Harvard Medical School and Brigham & Women's Hospital	Post-doc	2006-2007	Psychiatry
Boston University School of Medicine	Post-doc	2007-	Psychiatry

A. Research and Professional Experience

Positions and Employment

2004	Post-doctoral Fellow, Imperial College, London, United Kingdom
2005-2007	Research Fellow, Department of Surgery, Harvard Medical School
2005-2007	Research Fellow, Department of Surgery, Brigham & Women's Hospital, Boston, MA
2006-2007	Research Fellow, Department of Psychiatry, Harvard Medical School
2006-2007	Research Fellow, Department of Psychiatry, Brigham & Women's Hospital, Boston, MA
2007	Postdoctoral Researchers' Representative, Brigham & Women's Hospital, Boston, MA
2007-present	Postdoctoral Research Fellow, Department of Psychiatry, Boston University School of Medicine, Boston, MA
2008	Vice-Chair of the International Postdoctoral Committee, National Postdoctoral Association
2008-2009	Vice-Chair of the Advocacy Committee, National Postdoctoral Association
2009-present	Chair of the Advocacy Committee, National Postdoctoral Association

Honors

2000-2003	United Kingdom (UK) Medical Research Council (MRC) PhD Studentship
2003	1st Prize Poster Award, Imperial College London, UK
2006	Mysell Award, Harvard Medical School
2007	Research Excellence Award, Brigham and Women's Hospital, Harvard Medical School
2007	Travel Award, National Postdoctoral Association
2008	Poster selected as "Hot Topic" – Association for Research in Vision and Ophthalmology (ARVO) conference, Fort Lauderdale, Fl

B. Selected peer-reviewed publications (in chronological order).

1. [redacted] Walsh DT, Gentleman SM, Jen LS, Aruoma OI. *Ergothioneine treatment protects neurons against N-methyl-D-aspartate excitotoxicity in an in vivo rat retinal model.* Neurosci. Lett. 2002 Aug 2;328(1):55-9
2. [redacted] Walsh, DT., Jen, LS. and Gentleman, SM. *N-methyl-D-aspartate (NMDA) differentially affects amyloid precursor protein (APP) cleavage in the rat retinal-vitreal model.* Neuropathology & Applied Neurobiology. 2003 Vol. 29 (5):523-524
3. Croucher MJ, Patel H, Walsh DT [redacted] Gentleman SM, Fazal A, and Jen LS *Up-regulation of soluble amyloid precursor protein (APP) fragment secretion in the rat retina in vivo by metabotropic glutamate receptor stimulation.* NeuroReport 2003 Vol. 14 No. 13
4. Aruoma OI, [redacted] Walsh DT, Gentleman SM, Ke B, Liang YF, Higa T and Jen LS. *Effective Microorganism X (EM-X) protects retinal neurons in rats against N-methyl-D-aspartate excitotoxicity in vivo.* Free Radical Research 2003 Vol. 37 (1): 91-97.

5. [redacted] Walsh DT, Gentleman SM, Jen, LS. *Regulation of amyloid precursor protein (APP) processing by ion channel activity in an in vivo rat retinal system.* Neurobiol. Aging. 2004 Vol. 25: S227-S227.
6. [redacted] Moir RD, Lu S, Fu L, Chadwick O, Arnett E, Ericsson M, Klunk WE, Mathis CA, Chylack LT, Clark JI, Tanzi RE and Goldstein LE. *Early, premorbid detection of beta-amyloid pathology by non-invasive in vivo quasi-elastic light scattering in the lens.* The Journal of the Alzheimer's Association. 2006 Vol. 2 (3): S51-S52. O3-01-02.
7. Goldstein LE, Moir RD, Lu S, Fu L, Chadwick O, Arnett E, Ericsson M, Klunk WE, Mathis CA, Chylack LT, Clark JI, Tanzi RE and [redacted] *Non-invasive early detection of beta-amyloid molecular pathology by quasi-elastic light scattering in vivo.* The Journal of the Alzheimer's Association. 2006 Vol. 2 (3): S133-S133. P1-128.
8. Goldstein LE, Moir RD, Lu S, Fu L, Chadwick O, Arnett E, Ericsson M, Klunk WE, Mathis CA, Chylack LT, Clark JI, Tanzi RE and [redacted] *Non-invasive early detection of beta-amyloid molecular pathology by quasi-elastic light scattering in vivo.* The Journal of the Alzheimer's Association. 2006 Vol. 2 (3): S703-S703. IC-P-127.
9. Prelli F, Pankiewicz J, [redacted] Klunk W, Carp R, Meeker H, Sadowski M, Goldstein LE, Wisniewski T *PrPSc Aggregates in the ocular lens of symptomatic and pre-symptomatic prion infected mice.* Alzheimer's & Dementia: The Journal of the Alzheimer's Association. 2006 Vol. 2, Issue 3, S551-S552.
10. [redacted] Moir RD, Fu L, Mocofanescu A, Lu S, Xu W, Chadwick O, Rogers JT, Sadowski M, Wisniewski T, Klunk WE, Mathis CA, Clark JI, Tanzi RE and Goldstein LE. *Early detection of Alzheimer's disease-linked Aβ peptide accumulation in the lens by non-invasive quasi-elastic light scattering.* Alzheimer's & Dementia: The Journal of the Alzheimer's Association. 2007 Vol. 3 (3): S190-S190.
11. Rogers JT, Cho HH, Glicksman M, [redacted] Huang X, Goldstein L. *Alzheimer's disease drug discovery targeted to the APP MRNA 5' untranslated region, paroxetine and desferrioxamine proof-of-concept for a validated target.* Alzheimer's & Dementia: The Journal of the Alzheimer's Association. 2007 Vol. 3 (3): S195-S196.
12. [redacted] Moir R, Mocofanescu A, Burton M, Ghosh J, Ericsson M, Rogers J, Klunk W, Mathis C, Sadowski M, Wisniewski T, Clark J, Tanzi R and Goldstein L. *In vivo detection of Alzheimer's disease–linked Aβ peptide accumulation in the lens.* Alzheimer's and Dementia, 2008, Vol. 4 (4): T330 - T330.
13. Goldstein L. Moir R, Pineda R, [redacted] Burton M, Ghosh J., Soscia S, Mocofanescu A, Clark J, Robb R, Tanzi R and Hunter D. *Alzheimer's disease beta-amyloid pathology in Down syndrome cataract.* Alzheimer's and Dementia, 2008, Vol. 4 (4): T329 - T329.
14. Anderson PJB, Watts HR, Jen S, Gentleman SM, [redacted] Walsh DT Jen LS *Differential effects of interleukin-1β and S100B on amyloid precursor protein in rat retinal neurons.* Clinical Ophthalmology, 2009.
15. Rogers JT, Huang X, Goldstein LE, [redacted] Lahiri, DK, Cahill, CM, Cho HH, Fisher M, Glicksman MA, Cuny GD, Rogers MA, Greig NH. Smith DH, Branden LJ. *Specific APP translation blockers as a therapeutic intervention for Alzheimer's disease.* Alzheimer's & Dementia: The Journal of the Alzheimer's Association. 2009 Vol. 5 (4): S138-S139.
16. Ghosh J, Fabian D, Mallat A, Ramirez S, Burton M, [redacted] Casey N, Mocofanescu A, Hartley D, Stanton P, Goldstein LE. *The molecular chaperone human Aβ crystallin modulates amyloid-β neurotoxicity* Alzheimer's & Dementia: The Journal of the Alzheimer's Association. 2009 Vol. 5 (4): S304-S304.
17. Goldstein LE, Marcus MA, Moir RD, Mocofanescu A, Casey N, Burton MA, Pagano D, Rosen CJ, Bjornstad KA, Blakely EA and [redacted] *nvolvement of metals in Aβ aggregation in Alzheimer's disease brain and lens using X-ray Fluorescent Microscopy (XRFM) and Quasi-Elastic Light Scattering (QLS).* The Journal of the Alzheimer's Association. 2009 Vol. 5 (4): S489-S489.
18. [redacted], Pineda R, Moir RD, Burton MA, Ghosh J, Ericsson M, Soscia SJ, Mocofanescu A, Folkerth R, Robb RM, Clark JI, Tanzi RE, Hunter DG, Goldstein LE. *Cytosolic β-amyloid deposition and supranuclear cataracts in lenses from people with Down syndrome.* The Journal of the Alzheimer's Association. 2009 Vol. 5 (4): S501-S501.
19. [redacted] Moir RD, Mocofanescu A, Fu L, Lu S, Burton MA, Xu W, Ericsson M, Rogers JT, Chadwick O, Arnett E, Li JV, Sadowski M, Wisniewski T, Klunk WE, Mathis CA, Clark JI, Tanzi RE and Goldstein LE. *Detection of Early Alzheimer's Disease-Linked Aβ Peptide Accumulation by Non-Invasive Quasi-Elastic Light Scattering in vivo* (under revision).

20[redacted]ineda R, Moir RD, Lu S, Burton M, Ghosh J, Ericsson M, Soscia SJ, Mocofanescu A, Folkerth R, Robb RM, Clark JI, Tanzi RE, Hunter DG, Goldstein LE. *Alzheimer's Disease Amyloid-β Links Lens and Brain Pathology in Down Syndrome* (submitted).

C. Research Support

Pilot Project [redacted] 07/01/09–06/30/10
Boston University Alzheimer's Disease Center (NIH-funded P30-AG13846 Alzheimer's Disease Center)
Pilot Evaluation of a Laser-Based Non-Invasive Early Detection Instrument for Alzheimer's Disease

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
[redacted]	**Associate Professor**
eRA COMMONS USER NAME (credential, e.g., agency login)	
[redacted]	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Harvard University, Cambridge, MA	B.A.	1955	Physics
Rutgers University , New Brunswick, NJ	Ph.D.	1959	Physics

A. Positions and Honors

Positions and Employment

1959-62 Research Fellow, Stanford University,
1962-68 Assistant Professor of Physics, Tufts University
1969-77 Staff Scientist, Block Engineering, Inc.
1977-85 Associate Scientist, Eye Research Institute of Retina Foundation
1980- Associate in Ophthalmology, Harvard Medical School
1985- Senior Scientist, Schepens Eye Research Institute
1993- Senior Scientist, Mass. General Hospital, Wellman Laboratory
1999- Associate Professor in Dermatology, Harvard Medical School
1999- Associate Professor in Ophthalmology, Harvard Medical School

Honors and Awards

1981 IR100 Award for Scanning Laser Ophthalmoscope
1991 Fellow, Optical Society of America
1999 Edwin H. Land Medal, Optical Soc. of America and the Soc. Imaging Sci. and Technology
2003 Doctor of Science (ScD), honoris causa, SUNY College of Optometry

B. Selected peer-reviewed publications

1. *Book*: [redacted] Elementary Wave Optics. New York, Academic Press, 1969:270. Reissued by Dover Publications 2005.
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29. Wan D-S, Rajadhyaksha M and [redacted] Analysis of spherical aberration of a water immersion objective: applications to specimens with refractive indices 1.33-1.40. *J Microscopy* **197** 274-284 (2000).
30. Lin, CP and [redacted] Fiber-coupled multiplexed confocal microscope, *Optics Letters* **25** 954-957 (2000).
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51. ISSUED PATENT: Burns, SA and [redacted] Method and apparatus for measurement and correction of optical aberration **6,486,943** (2002).
52. ISSUED PATENT: Elsner; AE,Burns,SA, Dreher,AW, [redacted] maging apparatus and methods for near simultaneous observation of directly scattered light and multiply scattered light. **6,640,124** (2003).
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56. ISSUED PATENT: [redacted] and Dimas, CE Systems and methods for modifying wavefronts by amplifying stroke. **7,129,455** (2006).

C. Research Support (Some recent projects ongoing or completed in the last three years):

R44 EY11819 **Ferguson (PI)**
NIH
Portable line scanning laser ophthalmoscope. This is a simple version of a confocal ophthalmoscope.
Role: Co-PI

R01 EY 14106-01 **Lin (PI)**
NIH
Live microscopy and cytometry in vascular biology. This BRP develops new instrumentation and applies it in research into vascular growth and hemodynamics.
Role: Co-PI

R01 EY14165 [redacted]
NIH

New technologies for illumination and display in vision research. This BRG applies newly developed light sources and modulators for psychophysics. One of the projects uses a DMD spatial light modulator for a Maxwellian view tachistoscope and visual display for psychophysics.
Role: PI

R01 EY014375-01 **Williams (PI)**
NIH
Adaptive Optics Instrumentation for Advanced Ophthalmic Imaging. In this BRP the goal is to use adaptive optics technology to greatly improve human retinal imaging resolution.
Role: Co-PI

5R44EY016295-03 **Bierden (PI)** 03/01/05 – 08/31/09
NEI
SBIR Phase II Project Title: Long stroke Wavefront Correctors for Retinal Imaging