

Robert T. McGrath - *Curriculum Vitae*

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I. Various Roles with Battelle Memorial Institute:

- April 2010 – Present** **Battelle Memorial Institute** – Consultant on National Laboratory / University Partnerships, STEM Education and Race to the Top initiatives
- Feb. 2008–Mar. 2010** **Battelle Affiliated - National Renewable Energy Laboratory (NREL)** - Consultant on acquisition of the NREL M&O Contract, Deputy Laboratory Director for Science & Technology at NREL; National Lab / University Partnerships and STEM Education
- July 2004-Feb. 2008** **While serving as Sr. VP for Research at Ohio State** – Fostered Battelle / Ohio State partnerships on Agro/Bio and Medical Technologies, K-20 Education, Community Economic Development and more

With corporate headquarters in Columbus across the street from Ohio State, Battelle Memorial Institute is a research powerhouse with an annual budget in excess of \$4 billion. Battelle has responsibility for managing and operating seven different national laboratories for the federal government, including Oak Ridge National Lab, Idaho National Lab and the National Renewable Energy Lab. Battelle's charter as a not-for-profit, philanthropic institution mandates contributions to the communities in which Battelle operates. These contributions include significant efforts in regional economic development and advancing STEM education at universities across the country and within K-12 programs in selected states. I have been contributing in various ways to these and other Battelle initiatives throughout the past six years.

NREL is the nation's Lead Laboratory for research, development and commercialization of renewable and sustainable energy technologies. My contributions to Battelle's efforts at NREL included science & technology leadership within the proposal that resulted in award to our team of the DOE contract to manage and operate this mission critical laboratory. Subsequently, my responsibilities as deputy laboratory director included oversight and strategic planning for the Lab's entire R&D portfolio, encompassing the National Center for Photovoltaics, the National Wind Technology Center, the National Biofuels Center and more.

Notable accomplishments include:

- Played a key leadership role in the winning proposal bid by Battelle Memorial Institute and its partners for the contract to manage, operate, restructure and revitalize NREL.
- Served as Deputy Laboratory Director for the initial contract period, during which time I developed strategic partnerships with universities, other national labs and industry – such as:
 - Formalized partnerships and joint appointments with University of Colorado, Colorado School of Mines, Colorado State University, MIT and Stanford, which now provide expanded opportunities for faculty and students to engage in renewable energy research projects, and have led to several large competitively awarded research grants from NSF, DOE and the State of Colorado.
 - Worked with University of Colorado Boulder administration and faculty to establish the Renewable and Sustainable Energy Institute (RASEI) as a joint venture between UC Boulder and NREL.
 - Advanced NREL's infrastructure by working, for example, to procure funding for construction of the \$135 million Energy Systems Integration Facility supporting large scale integration of renewable generation into the nation's electrical grid, and to procure two competitively awarded grants of \$34 million each to establish the Advanced Thermochemical Biofuels Consortium and expand the Integrated Biorefinery Facility.

- Worked with NREL's Distinguished Research Fellows to restructure, redirect and expand the Laboratory's \$8 million/year internal R&D investment program, leading to five R&D 100 Awards over the past two years, along with exceptional recognition within various citation indices.
- Served as spokesperson for NREL in various venues, including testifying before the Senate Committee on Energy & Natural Resources, along with DOE Under Secretary Steve Koonin, on grid level energy storage.

II. July 2004 – July 2008 The Ohio State University
Senior Vice President for Research
Professor of Materials Science Engineering, Professor of Physics

With eighteen different colleges, enrollment of over 55,000 students and an annual budget in excess of \$3 billion, Ohio State is one of the largest and most comprehensive universities in the country.

As Senior Vice President for Research, I served as a member of President Karen Holbrook's small Executive Cabinet, along with Provost Barbara Snyder, Secretary to the Board of Trustees and the other Senior Vice Presidents for Business & Finance, Medicine & Health Systems and University Relations. President Holbrook's leadership style was inclusive and provided opportunity for me to participate in university wide, academic decision-making that included the continual development of the University's Academic Plan, a major initiative to improve the quality of graduate education, the campus and community master plan, a variety of issues associated with the medical center, the Development Campaign, and more.

During my tenure at Ohio State, we collectively produced dramatic improvements in freshman retention rate to over 90%, increased the six-year graduation rate to 73%, and established some exciting partnerships in K through 12 education. At the same time, under my leadership, Ohio State's research programs expanded dramatically, increasing 44% over a three-year period from just over \$500 million in 2004 to over \$720 million/year. Accompanying research ranking climbed from 18th in 2004, to 9th largest academic research institution in the nation in 2007. Ohio State's research sponsored by industry also increased notably during that period to over \$120 million, with associated ranking climbing from 6th to 2nd in the nation.

The dedication, hard work and innovation of the faculty are ultimately responsible for capturing research awards. However, as Sr. Vice President for Research, I encouraged and facilitated formation of interdisciplinary research teams that led directly to large R&D awards, such as NSF funding for a prestigious Materials Research Science & Engineering Center (MRSEC), a Nanoscale Science & Engineering Center (NSEC) on polymer based biomedical devices and an associated IGERT on molecular engineering of micro-devices; a critically important Clinical & Translation Sciences Award (CTSA) from NIH; and a variety of multi-million dollar partnerships with industry that leveraged State of Ohio economic development funds - encompassing innovative bioproducts from soy, advanced materials for jet turbines, very high field / high resolution magnetic resonance imaging and more.

II.1 Examples of Notable Academic Accomplishments:

- Establishment of the **Office of Undergraduate Research**, connecting undergraduates at all levels with researchers and research projects across the university. Student achievements are celebrated annually at the Denman Undergraduate Research Forum with more than 300 students presenting each year.
- Worked with deans from colleges of education, science and engineering, along with colleagues from Battelle Memorial Institute and the City of Columbus School District to establish the Science, Technology, Engineering & Math (**STEM**) **intensive Metro High School**. We are all very proud of accomplishments such as completion by every student of all high school algebra requirements by the end of the sophomore year, the contagious level of enthusiasm for learning that permeates the entire student body, and subsequent award to Battelle of a \$12 million Bill & Melinda Gates Foundation grant to replicate this high school model in other regions where Battelle operates research facilities.

- **Refined and Advanced the Institution's Academic Plan:** Partnering with the Provost, we identified \$110 million over five years to support Targeted Investments in Excellence (TIE). This program identified academic and research programs that were, or had potential to be, preeminent, while simultaneously identifying programs potentially unable to achieve the academic stature that the Institution desired. Within TIE, I led the evaluation process, and built broad consensus by engaging deans & associate deans from all of the colleges, the Faculty Senate leadership, interdisciplinary research center directors, and the President's Eminent Faculty Scholars. TIE funds supported programs in Music & Media; Population Health; Public Health Preparedness; Climate, Carbon & Water; Cosmology and Astro-Particle Physics; Energy & Sustainability; Mathematical Biosciences; Advanced Materials; the Micro-RNA Initiative; and Translational Plant Sciences.
- **Fund Raising:** Assisted many college deans in developing and nurturing relationships with existing and potential donors throughout the academic year and in conjunction with post-season football bowl games. Interacted extensively with donors such as the Denman family that sponsored the annual Undergraduate Research Forum; and was asked to take responsibility for a \$22 million gift, the second largest ever to Ohio State, for establishment of the Thomas Jefferson and John Glenn Endowed Chairs in Discovery and Space Exploration, along with extensive accompanying interdisciplinary student education and research programs.
- **State Government and Local Community Initiatives:**
 - Served as Ohio State's liaison on economic development, R&D investments, and economic policy with the Governor's Office, the Ohio Board of Regents, the Ohio Department of Economic Development, the Governor's Energy Office, the Mayor's Office, the Columbus City Council, and with key elected federal officials.
 - Was formally appointed (after working extensively with Ohio's Republican Governor Bob Taft) by Democratic Governor Ted Strickland to the State's Third Frontier Advisory Board, which manages the State's \$2.3 billion, ten year investment fund for simulating technology based economic development and job creation.
 - Developed a plan to establish a \$50 million State endowment fund, to be matched equally by institutional resources, for recruitment of outstanding faculty to endowed chairs within any Ohio public or private university. The Majority Leader of the State of Ohio Senate incorporated language verbatim from my concept paper into the state's 2008/09 biennial budget. The endowment fund so established is being used today to recruit outstanding talent to Ohio.
- **National Policy Initiatives and Service to Higher Education:**
 - Served as co-author on the Brookings Institute's Policy Brief entitled *Energy Discovery Innovation Institutes – A Step Toward America's Energy Sustainability*, February 2009. The report draws attention to the large disparities between federal investments in defense or health care R&D, as compared to those for clean energy and greenhouse gas reductions. Recommendations from our report are reflected within the U.S. Department of Energy's 2010 initiatives on Energy Innovation Hubs, and can also be found within U.S. House of Representatives legislation such as Waxman-Markey and more recently (May 2010) within the House version of America COMPETES legislation under the title of Clean Energy Consortia.
 - Professional Societies and Organizations:
 - Elected to the executive Committee of NASULGC's (APLU's) Council on Graduate Research Policy and Education (CRPGE) (2004-08) and was subsequently elected 2007/08 Council Chair.
 - Elected to the Board of Directors of Oak Ridge Associated Universities in 2005 (with over 100 university members nationwide); subsequently elected Incoming Board Chair for 2008
 - Professional Society Membership & Contributions: American Physical Society, IEEE, the American Society for Engineering Education; American Association for the Advancement of Science (AAAS), Hosted and Organized the American Physical Society's - Gaseous Electronics

Conference (GEC) in 2001; served on the GEC Program/Executive Committee 2000/01/02; American Vacuum Society, Plasma Technology Division, Elected to Conference Program Committee 2001/02.

- Regular reviewer of papers submitted for publication to J. Vac. Sci & Technl., to APS's Phys. Rev., and to IEEE's Transactions in Plasma Science.
- Represented Ohio State at Association of American University (AAU) meetings on national policies affecting research, higher education, economic development and national competitiveness.
- Active participant and supporter of National Academy and National Council on Competitiveness initiatives, such as Rising Above the Gathering Storm and America Competes.

II.2 Examples: Administrative Responsibilities & Accomplishments as Senior VP for Research:

- Served as **President of the Ohio State Research Foundation (OSURF)**, with administrative responsibilities for all federal, state and industry sponsored research contracts, totaling \$720 million in 2007. Restructured OSURF to include technology licensing and commercialization and laid the groundwork for re-incorporation of the Research Foundation into the Universities centralized administrative structure.
- Served as permanent member of the Technology Columbus (Tech Columbus) economic development council along with business and finance leaders from across Ohio. Also served as President of the University's Science & Technology Research Park (SciTech), with responsibility for construction and operation of that campus, support infrastructure for start-up companies, and attraction of major industrial partners. This park also serves as home for the STEM intensive Metro High School that we established in 2007.
- Served as **Institutional Official** for all Human Subjects Research, for Research Animal Care and Use, and for Research Misconduct. These roles provided extensive experience with difficult problems such as harassment of faculty researchers by animal rights activists; lawsuits that achieved national prominence; and cases of research or financial misconduct requiring disciplinary actions.
 - Responsible for three Institutional Review Boards (IRBs) – Cancer, Social & Behavioral Sciences and Biological Sciences, as well as the Institutional Laboratory Animal Care and Use Committee;
 - Led the successful effort to acquire accreditation for all of Ohio State's Human Subjects Research Program, including social and behavioral sciences, from the Association for the Accreditation of Human Research Protection Programs (AAHRPP).
 - Led the effort to reestablish the University's accreditation from the Association for Assessment & Accreditation of Laboratory Animal Care (AAALAC). (Unfortunately, I had inherited a situation under which accreditation was being rescinded.)
- Served on the Medical Center's Advisory Board at the request of the University President and Board of Trustees, supporting OSU's Comprehensive Cancer Center, Medical R&D and Patient Care programs.
- Served on the Board of Directors of Ohio State's Transportation Research Center, with industry partners including Honda, Caterpillar, Chrysler, Ford, GM, Eaton and others.
- Served as a permanent member of the Executive Board for University Medical Center Partners (UMCP), along with the CEO of Battelle and other community leaders. UMCP was a limited liability corporation structured to evaluate and advance large scale investments & partnerships such as:
 - Analysis of cost, clinical efficacy and return on investment of a ~\$250 million accelerator based patient care facility providing high energy carbon ion irradiation of localized cancer tumors (this in contrast to less expensive / less effective treatment options that use high energy proton irradiation);
 - Developing business plans and corporate partnerships for medical informatics.

III. Nov. 1996 - June 2004	The Pennsylvania State University
	Professor of Engineering Science
Sept 1998 - June 2004	Associate Vice President for Research,
	Director of Strategic & Interdisciplinary Initiatives,
	Director of the Marine Corps Research University
July 2004 - Present	Adjunct Professor of Engineering Science
Aug. 1980 - June 1984	Assistant Professor of Engineering

III.1 Examples of Duties and Accomplishments:

- Served as Director (Dean) of Interdisciplinary Programs with responsibility for promotion and tenure of several hundred interdisciplinary faculty & research staff within the Materials Research Laboratory, the Environmental Resources Research Institute and the DoD sponsored Applied Research Laboratory.
- As Director of Strategic and Interdisciplinary Initiatives:
 - Established the Social Sciences Research Institute by working with deans and faculty from the Colleges of Health & Human Development, Liberal Arts and Medicine.
 - Restructured the Institute for Arts & Humanities, in cooperation with the Colleges of Arts & Architecture and Liberal Arts, to render it more inclusive and with broader impact on campus life.
 - Worked with faculty and college leaders to restructure Penn State's Materials Research Laboratory into a more inclusive, more comprehensive and more effective Materials Research Institute. Notable results included winning a prestigious NSF Materials Research Science & Engineering Center (MRSEC), and award of eight Nanoscale Interdisciplinary Research Team (NIRT) awards out of twelve allowable submissions over a three year period - a phenomenal success rate with each NIRT awarded between \$1 to \$2 million.
 - Served as PI and / or Program Director for large DoD awards such as
 - The \$75 million award establishing the Marine Corps Research University at Penn State,
 - The \$51 million award from the Defense Threat Reduction Agency on biosensors, chemical sensors, radiological sensors and assessment / mitigation of chemical explosive and bioagent threats.
- **Examples of Accomplishments in Educational Excellence:** Personally directed development of a successful NSF Partnership for Innovation proposal (initially a small \$100k award) on education of two-year associate degree community college students for careers in the growing microelectronics and nanotechnology fields. We leveraged the underutilized capacity of specialized (and expensive) nanotechnology equipment and clean-rooms within the Research Park to provide extensive, hands-on training, while simultaneously maintaining complex sets of delicate equipment in excellent working condition. This program grew quickly to include all 14 community colleges and all 14 four-year degree colleges in the Pennsylvania System of Higher Education. It has subsequently expanded further to become an NSF sponsored National Center for Educational Excellence in Nanotechnology.
- **As Assistant Professor and later as Professor in Engineering Sciences & Mechanics:**
 - Taught numerous undergraduate and graduate courses, and developed several new graduate and undergraduate level courses (see detailed list below). My Department Chair reported that student feedback was excellent, with the course I taught on applied statistical physics to the honors undergraduate engineering students regularly rated during exit interviews with graduating seniors as the best and most impactful course of their undergraduate careers.
 - Mentored graduate M.S. and PhD students as well as numerous undergraduate honors engineering thesis projects (see detailed list below).
 - Was an active member of the Curriculum Planning Committee, PhD Candidacy Committee, and the Undergraduate Honors Program;
 - During this period, my personal research was funded by NSF [including a Career (Young Investigator) Award], Argonne National Laboratory, Sandia National Laboratories, SEMATECH, Westinghouse R&D, Applied Materials, and Air Products & Chemicals (see detailed list below).

IV. July 1984 – Feb. 1998

**Sandia National Laboratories, Albuquerque, NM
Division Manager / R&D Program Manager / Research Scientist,**

Examples of responsibilities:

- Developed and subsequently led a variety of basic & applied research programs, including:
 - Cooperative Research & Development Activities (CRADAs) with SEMATECH on plasma chemistries and equipment design for microelectronics manufacturing,
 - Led the Advanced Scientific Computing Initiative (ASCI) Applications department;
 - Led CRADAs on development of plasma driven flat panel displays for DoD applications in intense sunlight and night-time operational environments, and for commercial consumer applications;
 - Supported performance / manufacturing problems encountered within neutron generator portion of the National Nuclear Security Agency's (NNSA's) mission for nuclear stockpile stewardship.
- From 1984 through 1995, led and contributed to U.S. and international research teams on energy production via magnetic confinement fusion:
 - Managed the Fusion Technology Division and its Plasma Materials Test Facility. The PMTF included high-energy electron beams and multi-MW ion beams for destructive testing of actively cooled prototype components used in tokamak magnetic confinement devices. Our team specialized in design, testing and operation of plasma contacting components that operated under steady-state heat loads comparable to those experienced during spacecraft reentry. The work simultaneously involved a complex set of high energy ion interactions with materials for control of the radiation physics within the tokamak boundary layer.
 - Served as DOE designated U.S. Coordinator for International Collaborations on Tokamak Plasma Facing Components (PFCs) & Plasma Materials Interactions (1990-1994) for joint research with the Japanese Atomic Energy Research Institute (JAERI); the Japanese National Institute for Fusion Science (NIFS); Russian Federation Collaborations with Kurchatov (Moscow) and Efremov (St. Petersburg) Laboratories; Commissariat à l'Énergie Atomique (CEA) Collaboration on PFCs for Tore Supra; the Forschungszentrum's Institute for Plasma Physics, Advanced Limiters for TEXTOR; and PFCs for the International Thermonuclear Experimental Reactor (ITER). Spent eighteen months during 1986 and 1987 at the Forschungszentrum in Juelich, Germany and CEA Cadarache, France.
- Continually throughout this period, provided opportunities for post docs, graduate and undergraduate students to conduct research projects in magnetic fusion and microelectronics manufacturing. Defined and/or supervised PhD and MS thesis projects for students from the University of Michigan, UCLA, UCSD, North Carolina State, Penn State, University of New Mexico and University of Puerto Rico, often contributing via appointment as adjunct faculty member and/or member of the thesis committee.

V. Additional Prior Positions:

1980 – 1984 Visiting Summer Research Scientist, Fusion Power, Argonne National Laboratory

1978 – 1983 Shorter periods as consultant, visiting researcher or graduate student intern at Pacific Northwest National Laboratory, Exxon Research and TRW

1975-1976 Systems Engineer for HRB Singer (now a division of Raytheon). Responsible for integration of the information technology system that processed sensor data from around the world and provided situational awareness and mapping information to the aircraft carrier Kennedy, Flagship of the U.S. Seventh Fleet. This early stage, developmental IT system provided command / control and tactical support for combat operations.

VI. Education:

- The Pennsylvania State University Honors - Engineering Sciences B.S.
 Physics M.S.
 Mathematics M.A.
- The University of Michigan Nuclear Science & Engineering Ph.D.

VII. Personal Information & Interests:

- Married to Dr. Elizabeth (Betsy) Corwin for 27 years, with two wonderful daughters ages 24 and 21
- Sports: Running – 5ks, 10ks, an occasional marathon. Any and all racket sports / skiing / hiking
- Active Security Clearance since 1984

VIII. Academic Resume:

Research Awards / Students Mentored / Course Taught / Publications:

Scholarly activities include authorship of over sixty journal publications, many co-authored with graduate students, post docs or junior researchers working under my direction, and authorship of over eighty published abstracts and conference presentations. This is in addition to release of numerous technical reports and presentation of an uncountable number of technical seminars. A complete list of refereed journal publications is included in an accompanying file.

VIII.1 External Funding / Sponsored Research:

(Even while functioning in research administration roles, my commitment to education and enjoyment of basic research motivated me to very selectively write research proposals, execute the research project awarded, supervise graduate / undergraduate students and post docs, and publish results obtained.)

Selected Large Team Proposals & Awards led by McGrath:

- *Strategic Partner for the Defense Threat Reduction Agency on Basic / Applied R&D and Policy Analysis*, Proposal Organizer / Program Manager / PI: R. McGrath, Technical Coordinator: T. Donnellan, Sponsor: Defense Threat Reduction Agency, Award Amt: \$51 million, April 2003-May 2006. This is a partnership of six U.S. universities covering bio, chemical and radiation sensors for threat detection and mitigation.
- *The Marine Corps Research University, Research & Education Reach Back Capabilities for USMC*, PI: R. McGrath, Sponsor: U.S. Marine Corps, Phase I Award Amt: \$49.5 million, Sept. 1999 to Aug. 2003, Phase II award Amt: \$25 million, Sept. 2003 – Aug. 2004. Encompasses School of Business Logistics Training for all new MC officers and provides the Corps with “reach-back” R&D capabilities in various technologies.
- *NanoScience & Technology R&D*, PI: R. McGrath, Sponsor: Pennsylvania Ben Franklin Technology Development Authority, Award Amt: \$3.5 million, July 2002 – June 2003
- *NanoScience & Technology R&D Follow-on*, PI: R. McGrath, Sponsor: Ben Franklin Technology Development Authority, Amt: \$3.5 million, July 2003 – June 2004
- *Cooperative Research And Development Agreement (CRADA): SNL / SEMATECH R&D Cooperation on Thin Film Processing Equipment Improvement for Microelectronics Manufacturing*, PI: R. McGrath, Sponsors: DARPA and SEMATECH, Amt. \$4 million over 2 years, 1995 / 96
- *Cooperative Research And Development Agreement (CRADA): Photonics Systems / Sandia Labs R&D Cooperation on Plasma Driven Flat Panel Displays for Defense and Commercial Applications*, PI: R. McGrath, Sponsor: DOE CRADA Office & DARPA, \$2 million over 2.5 years, 1994 / 1995
- *Arc Discharge Dynamics in Neutron Generators*, Sponsor: DOE’s Advanced Scientific Computing Initiative (ASCI) Applications Program; Proposal developed and presented by R. McGrath supporting numerous divisions at SNL, Amt. approximately \$5 million / yr or \$20M total. Awarded:1997 - 2001
- *Actively Cooled Pumped Limiter for Boundary Layer Fueling and Impurity Control on The Tore Supra Tokamak in Cadarache, France*; PI: R. McGrath, Sponsor: DOE’s Office of Fusion Energy – Confinement Physics Division, Annual proposals submitted 1990 - 94. Amt: \$5.5 million over 5yrs.
- *1.5 MW Electron Beam Facility for Plasma Facing Components and Plasma Materials Interactions Testing*; PI: R. McGrath, Sponsor: DOE’s Office of Fusion Energy – Fusion Technology Division, Award Amt. \$2 million per year, Annual proposals submitted -1990, 91, 92, 93, 94, totaling ~\$8 M
- *High Pressure Helium Coolant Loop for the 30kW Electron Beam Test Facility*, PI: R. McGrath, Sponsor: DOE’s Office of Fusion Energy, Technology Division, 1992/93, ~\$600k awarded
- *A Hot Cell Housed, 30kW Electron Beam Test System for Study of Neutron Damage to Fusion Materials*, PI: R. McGrath, Sponsor: DOE’s Office of Fusion Energy – Fusion Technology Division, ~\$1.2 million awarded, 1992/93
- Other examples available

Individual Investigator Research Proposals & Awards for R. McGrath:

- *Thin Film Palladium Metal Hydrogen Sensors for Industry of the Future Applications*, PI: R. McGrath, Contributors: R. Messier, M. Horn, Penn State, A. McDaniel, Sandia National Labs, and F. Schweighardt, Air Products & Chemicals; Sponsor: Dept. of Energy; Award Amt: \$1.3 M, 2001-2003
- *Hydrogen Sensors for Early Detection of Necrotizing Enterocolitis in Low Birth Weight Neonates*, PI: R. McGrath, Collaborators: C. Palmer, J. Kendig, Neonatology, Hershey College of Medicine, M. Horn PSU, A. McDaniel, Sandia National Laboratories, NIH's Institute for Biomedical Engineering and Medical Imaging, Requested Amt: \$2.4 million over four years. Good reviews but not funded.
- *Processes Development and Discharge Diagnostics for BCl_3 Chemical Processes for ICP Metal Etching in Microelectronic Manufacturing*; PI: R. McGrath, Sponsor: Applied Materials Inc., Award Amt. \$1.2 million, 1998/99
- *Ion Energy Distribution Function Measurements in High Pressure Chamber Cleaning Discharges Using NF_3* ; PI: R. McGrath, Sponsor: Air Products & Chemicals, Award Amt: \$150k, 2001 - 2003
- *Computational Modeling of Metal Etch Chemistries for Microelectronics Manufacturing*; PI: R. McGrath, Sponsor: Sandia National Labs award to Penn State; \$180k, 1998/99
- *Plasma Interactions with Vacuum Chamber Walls in Etch Process Reactors*; PI: R. McGrath, Sponsor: SEMATECH, Award Amt: \$45k, 1999
- *Transport of Sputtered Material in Tokamak Boundary Layers*, PI: R. McGrath, Sponsor: Argonne National Labs, ~\$50k, 1982
- *Visiting Summer Faculty Proposal*, PI: R. McGrath, Argonne National Labs, 1981, 1982, 1983
- *Redeposition of Sputtered Material in Tokamaks*, PI: R. McGrath, Sponsor: Argonne National Labs, ~\$50k, 1983
- *Advanced Limiter Test-II for TEXTOR*, PI: R. McGrath, Sponsor: Sandia National Labs, ~\$75k, 1983
- *Experimental System for Property Measurements of Redeposited Materials in Tokamaks*, PI: R. McGrath, Sponsor: Westinghouse R&D, ~75k, 1983/84
- NSF Career (Young Investigator) Award: *Plasma Collisional Kinetics in Tokamak Boundary Layers*, PI: R. McGrath, ~\$100k, 1981-82

VIII.2 Students Mentored:

Graduate Students Supervised:

- Paul Sunol, *Protective Barriers for Selective Palladium Metal Hydrogen Sensors*, PhD, Aug. 2004
- Hsin-Pai Hsueh, *Plasma Diagnostics and Characterization of Dielectric Films*, PhD, Engineering Science, Penn State University, August 2003
- Raviparkash Jayaraman, *Thin Film Hydrogen Sensors: A Materials Processing Approach*, PhD, Engineering Science, Penn State University, December 2002
- Eshwar Dandapani, *Optical Emission Spectroscopy of Fluorocarbon Discharges During Oxide Etch*, M.S., Engineering Science, Penn State University, August 2000
- Raviprakash Jayaraman, *Mass Spectroscopy of Dielectric and Metal Etch Discharges: A Study of C_2F_6 , CHF_3 and Cl_2 / BCl_3 Discharge Chemistries*, M.S., Engineering Science, December 1998
- John A. Harris, *Plasma-Neutral Interactions for the Advanced Limiter Test-I Operation on TEXTOR*, PhD, Nuclear Engineering, Penn State University, May 1988
- Dennis L. Yochison, *Sputtering Properties of the Redeposited Surface in Fusion Confinement Impurity Control*, PhD, Nuclear Engineering, August 1989
- John A. Harris, *Kinetic Modeling of Plasma – Limiter Interactions in the TEXTOR Edge Region*, M.S., Nuclear Engineering, Penn State University, December 1985
- Dennis L. Yochison, *Design and Application of a High Energy Particle Beam Sputtering System in Fusion Materials Research*, M.S., Nuclear Engineering, Penn State University, August 1984

- Glenn S. Schwartz, *Optimization Method for the Blanket Design of Fusion – Fission Hybrid Reactors*, M.S., Nuclear Engineering, Penn State University, November 1982
- Stephen J. Tobin*, *Carbon Impurity Production and Transport from the Sandia Labs' Inertially-Cooled Horizontal Limiter in the Tore Supra Tokamak*, PhD, University of Michigan, 1996
- Craig A. Outten*, *Electron Cyclotron Resonance Hydrogen / Helium Plasma Characterization and Simulation of the Pumping in Tokamaks*, PhD, Nuclear Science & Engineering, University of Michigan, 1992
- Keyes Neimer*, *Relativistic Electron Interactions with First Wall Materials During Tokamak Disruptions*, PhD, Nuclear Engineering, North Carolina State University, 1989

* For these students, I defined the thesis work, wrote a successful proposal for funding, recruited a graduate student, procured supplemental fellowship support, and provided technical supervision for execution, while delegating day to day oversight to one of the younger, developing researchers on my team.

Honors Engineering Senior Theses Projects Supervised:

- Wendy McCullough, *Atomic Collision Processes in Micro-discharges for Plasma Flat Panel Display Pixels*, Honors Senior Thesis, Engineering Science, Penn State University, April 1999
- Paul F. Hines Jr., *An Experimental System for VUV Photon Emission Measurements in AC Driven Plasma Flat Panel Display Micro-discharges*, Honors Senior Thesis, Engineering Science, Penn State University, April 1998
- Thomas E. Patno, *Electric Field Profiles in RF Driven Processing Plasmas*, Honors Senior Thesis, Engineering Science, Penn State University, May 1998
- Joseph L. Staudenmeier, *Charged Particle Collisions in the Tokamak Edge Region*, Honors Senior Thesis, Engineering Science, Penn State University, May 1984
- Ned A. Brokloff, *Fuel Cycle Analysis of a Fusion-Fission Hybrid Reactor Concept Based on Starfire*, Honors Senior Thesis, Engineering Science, Penn State University, May 1982
- Pragnesh N. Shah, *Optimization of Tritium Production Through the Use of Neutron Reflectors in a Tokamak Reactor*, Honors Senior Thesis, Engineering Science, Penn State University, May 1982
- Mark J. Poploski, *Neutronics Analysis of Fissile Fuel Breeding in a Hybrid Blanket Incorporated into the Starfire Tokamak*, Honors Senior Thesis, Engineering Science, Penn State University, May 1982

Additional Activities Supporting Graduate & Undergraduate Education:

- Served on MS and PhD committees for students in Engineering Science, Nuclear Engineering, Chemical Engineering, and Aerospace Engineering.
- While at Sandia, regularly supervised summer internships for undergraduate and graduate students from University of Puerto Rico, University of New Mexico, Penn State, University of Michigan, North Carolina State, UCLA and UCSD.
- Supervised post docs and numerous junior faculty and research scientists.
- Active participant on Departmental / College Committees for Undergraduate / Graduate Curriculum Planning, PhD Candidacy and Honors Programs.

VIII.3 Courses Taught (* indicates new course developed):

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|------------------------------------|---|
| • Electrical / Nuclear Engineering | 490, Introduction to Plasma Physics |
| • Electrical / Nuclear Engineering | 491, Plasma Physics Laboratory |
| • Electrical / Nuclear Engineering | *540, Plasma Fluids |
| • Electrical / Nuclear Engineering | *541, Plasma Kinetics |
| • Electrical / Nuclear Engineering | *598, Plasma Chemistries for Microelectronics Manufacturing |
| • Nuclear Engineering, | 420, Neutron Transport & Reactor Dynamics |
| • Nuclear Engineering | 415, Radiation Measurements Laboratory |
| • Electrical / Nuclear Engineering | *307, Applied Statistical Mechanics |

- Electrical Engineering 315, Solid State Devices
- Nuclear Engineering 200, Radiation Safety
- Engineering Mechanics 12, Static Loads
- Astronomy 101, Introduction to Astronomy, with lab
- Mathematics 10, Trigonometry / Pre-calculus

VIII.4 Invited Seminars: (There have been too many to count. A complete list is NOT available):

Numerous seminars given in such venues as:

- Institute for Plasma Physics, Forschungszentrum, Juelich, Germany,
- The Max Planck Institute for Plasma Physics, Garching, Germany
- International Thermonuclear Experimental Reactor (ITER) Central Site at UCSD, San Diego, CA
- The Tore Supra site at Centre á L'Energie Atomique, Cadarache, France
- Chemical & Metallurgy Division of The Russian Academy, Kerchatov Institute
- Efremov Institute in St. Petersburg
- Annual U.S./Japan Workshop on Plasma Materials Interactions in Tokamak Magnetic Fusion Systems
- The Princeton Plasma Physics Laboratory
- University seminars at University of Michigan, University of Wisconsin, Penn State, UCLA, UCSD, Univ. of New Mexico and more
- Technical presentations & seminars at National Labs, including Argonne National Labs, Oak Ridge National Labs, Lawrence Livermore National Labs, Los Alamos National Lab, Battelle Pacific Northwest National Lab, and far too many to count at both Sandia National Labs and the Department of Energy Headquarters
- Recently Invited as Plenary Speaker for ASM International's 2010 Materials Science & Technology Conference, Plenary session entitled Energy Infrastructure, Policy and Security.