

Dr. Amit Goyal, Ph.D, MBA

Member, National Academy of Engineering (NAE)

Member, National Academy of Inventors (NAI)

Member, National Materials & Manufacturing Board (NMMB)

Fellow MRS¹, AAAS², APS³, IEEE⁴, WIF⁵, ASM⁶, IOP⁷, ACERS⁸, WTN⁹

SUNY Distinguished Professor, University at Buffalo

SUNY Empire Innovation Professor, University at Buffalo

Director (April 2022 – date), NYS Center of Excellence in Plastics Recycling & Innovation

Founding Director (1/2015-7/2021), The RENEW Institute, University at Buffalo

Emeritus Corporate Fellow (1/2015-date), Oak Ridge National Laboratory

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Employment History	1/2015- SUNY Distinguished Professor¹⁰ and SUNY Empire Innovation Professor¹¹ School of Engineering & Applied Sciences (SEAS), University at Buffalo (UB). 3/2022- Director , New York State Center of Excellence in Plastics Recycling & Innovation ¹² , UB. 7/2021- Director , Laboratory for Heteroepitaxial Growth of Functional Materials and Devices, UB. 2019-22 Director , Plastics Recycling and Waste Tire Recycling Projects 2015-21 Founding Director , The RENEW ^{13,14} Institute, UB. 1/2015- Emeritus Corporate Fellow , Oak Ridge National Laboratory. 8/2010- President & CEO , TapeSolar Inc., a private-equity funded, solar company. 8/2010- President & CEO , TexMat LLC., an IP holding company. 2010-14 Chair, ORNL Corporate Fellows Council , UT-Battelle Inc. 2009-10 Vice-Chair, ORNL Corporate Fellows Council , UT-Battelle Inc. Oak Ridge National Laboratory, Oak Ridge, TN. 2008-14 UT-Battelle/ORNL Corporate Fellow . Oak Ridge National Laboratory, Oak Ridge, TN.
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¹ MRS = Materials Research Society, www.mrs.org.

² AAAS = American Association for Advancement of Science, <http://www.aaas.org/>.

³ APS = American Physical Society, <http://www.aps.org/>.

⁴ IEEE = Institute of Electrical and Electronics Engineers, <https://www.ieee.org>.

⁵ WIF = World Innovation Foundation, <http://www.thewif.org.uk/>.

⁶ ASM = American Society of Metals. <http://www.asminternational.org/>.

⁷ IOP = Institute of Physics, <http://www.iop.org/>.

⁸ ACERS = American ceramic Society, <http://www.acers.org/>.

⁹ WTN = World Technology Network, <http://www.wtn.net/>.

¹⁰ This system-wide rank (across 64 campuses) of *SUNY Distinguished Professor* is an order above full professorship at UB and is considered the highest rank of professor in the SUNY system. The *SUNY Distinguished Professorship* is conferred upon faculty having achieved national or international prominence and a distinguished reputation within their chosen field through significant contributions to the research and scholarship, or through artistic performance or achievement in the fine and performing arts.

¹¹ The *SUNY Empire Innovation Professor* Program is designed to attract exceptionally distinguished faculty to the State of New York.

¹² <https://www.buffalo.edu/ubnow/stories/2022/04/plastics-recycling-center.html>

¹³ <http://www.buffalo.edu/news/releases/2014/12/035.html>

¹⁴ <http://www.buffalo.edu/ubnow/stories/2021/04/goyal-renew.html>

	<p>2007-11 Wire Research Co-ordinator and Task Leader, HTS Materials Projects, Oak Ridge National Laboratory, Oak Ridge, TN.</p> <p>2004-08 ORNL Distinguished Scientist, Oak Ridge National Laboratory.</p> <p>2004-07 Task Manager, Superconducting Materials Research, Metals & Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN.</p> <p>2004-07 Team Leader, Superconducting Materials, Functional Materials, Metals & Ceramics Division, Oak Ridge National Laboratory.</p> <p>2003- Battelle Distinguished Inventor, Columbus, Ohio.</p> <p>2000-04 Senior Scientist, ORNL/UT-Battelle, Oak Ridge, TN.</p> <p>1997-00 Materials Scientist, Lockheed-Martin Energy Research, Oak Ridge, TN.</p> <p>1993-97 Staff Scientist, Oak Ridge National Laboratory, TN.</p> <p>1991-93 Fellow, Oak Ridge Institute of Science & Technology, TN.</p> <p>1988-91 Fellow, University of Rochester, Rochester, NY.</p>
Educational Training	<p>2005 “Managing Technical Professionals and Organizations¹⁵,” MIT’s Sloan School of Management. March 31-April 1, 2005. Executive Series on Management, Innovation and Technology.</p> <p>2001-02 Executive Masters in Business Administration (MBA)¹⁶, Krannert School of Management, Purdue University, West Lafayette, IN.</p> <p>2001-02 Executive Masters in International Business Administration (MBA)⁹, Tilburg University, The Netherlands.</p> <p>1988-91 Ph.D. in Materials Science & Engineering, Univ. of Rochester, NY.</p> <p>1986-88 M.S. in Mech. & Aerospace Engineering, Univ. of Rochester, NY.</p> <p>1982-86 B.Tech. in Metallurgical Engineering, Indian Institute of Technology, India.</p>
National Impact: Via service on National Academy of Science, Engineering and Medicine (NASEM) Committees	<ul style="list-style-type: none"> • <u>Member, National Materials & Manufacturing Board (NMMB) (December 2020- to date¹⁷):</u> <ul style="list-style-type: none"> - The NMMB combines the charges of two preexisting boards: the National Materials Advisory Board and the Board on Manufacturing and Engineering Design. Its mission is to build on the past achievements of its parent boards by providing objective, independent assessments of the current state of materials and manufacturing research, including at the atomic, molecular, and nanoscales. It’s also charged with assessing the applications of new and existing materials in innovative ways, including pilot-scale and large-scale manufacturing, the design of new devices and disposal of materials. The NMMB is funded by a combination of government agencies and private sponsors. Public support has come from U.S. Department of Defense, U.S. Department of Energy, NASA, Federal Aviation Administration, and National Institutes of Health. • <u>Member, NASEM Committee on – Advising NSF on its Efforts to Achieve the Nation’s Vision for the Materials Genome Initiative (DMREF) (July 2021-date¹⁸):</u> <ul style="list-style-type: none"> - This committee is examining the impact of the National Science Foundation’s program “<i>Designing Materials to Revolutionize and Engineer Our Future</i>

¹⁵ This is an executive business program developed for senior management executives from private and public sector organizations involved with science & technology, including Chief Information Officers, Chief Technologists, Directors of R&D, Heads of Engineering, Vice Presidents of Engineering and Vice Presidents of Research.
<http://mitsloan.mit.edu/execed/epp/courses/tech-professionals.php>

¹⁶ This executive program was a collaborative effort of the Krannert Graduate School of Management of Purdue University in the United States (rated 6th by the Wall Street Journal, 2001); Tias Business School of Tilburg University in the Netherlands (rated 3rd in Economics in Europe); the Budapest School of Management of the Budapest University of Economic Sciences and Public Administration (BUESPA) in Hungary (top school of economics and management in Eastern Europe); and ESCP-EAP European School of Management in Paris (Managed by the Chamber of Commerce, France), France. The program consisted of six concentrated two-week sessions interdispersed throughout a two-year long program period allowing participants (mainly senior executives) to maintain their job responsibilities while they acquire the broad range of managerial skills needed to be effective in today’s and tomorrow’s international business environment. A majority of the class was composed of Presidents, CEO’s, CFO’s and other senior executives from large companies worldwide.

¹⁷ <http://www.buffalo.edu/news/releases/2021/01/006.html>

¹⁸ <http://engineering.buffalo.edu/home/news/scas.host.html/content/shared/engineering/home/articles/news-articles/2021/goyal-appointed-to-national-academies-committee-to-advise-nsf-on-detail.html>

	<p>(DMREF)” with the goal of furthering the nation's vision for the Materials Genome Initiative (MGI). It will evaluate the program’s goals, progress, and scientific accomplishments within the context of similar efforts both within the U.S. and abroad. It will make recommendations to make the NSF-DMREF more impactful towards realizing the goals of the MGI program.</p> <ul style="list-style-type: none"> • <u>Member, NASEM Committee on – Developing the United States National Smart Manufacturing Plan, a congressional mandated study by the Dept. of Energy (DOE) Secretary in partnership with the National Academies</u> (October 2021- date) <ul style="list-style-type: none"> - DOE to develop a National Plan, in consultation with the National Academies, for smart manufacturing technology development and deployment to improve the productivity and energy efficiency of the manufacturing sector of the United States, as per the language set forth in The Energy Act of 2020, Sec. 6006 on pages 1113 and 1115. • <u>Member, NASEM Committee on - Congressionally-Mandated Study on Technology Transfer from DOE National Laboratories</u> <ul style="list-style-type: none"> - Not later than 3 years after the enactment of this Act, the Secretary shall enter into an agreement with the National Academies of Science, Engineering, and Medicine to submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate a report on <i>programmatic gaps that exist to advance the commercial application of technologies developed at the National Laboratories</i> (as defined in section 2(3) of the Energy Policy Act of 2005 (42 U.S.C. 15801(3))) • <u>Member, NASEM Panel for reviewing the NIST Materials Measurement Laboratory</u> • <u>Member, NASEM Panel for reviewing the U.S. Army Research Laboratory in the area of Materials Science</u> • <u>Member, National Academies Intelligence Science and Technology Experts Group</u>
<p>Management & Administrative Experience</p>	<ul style="list-style-type: none"> • <u>Founding Director, NYS Center of Excellence on Plastics Recycling & Innovation, University at Buffalo (UB) (April 2022 - date):</u> <ul style="list-style-type: none"> - An <i>externally-funded</i>, multidisciplinary initiative at \$1,500,000.00/yr. Funding for first three years of \$4,500,000.00 is in place. Funded by the New York Department of Environmental Conservation (NYDEC). Involves 8 multidisciplinary faculty from School of Engineering & Applied Sciences (SEAS), College of Arts & Sciences (CAS) and School of Management (SOM). The initiative has already informally started in September 2021. • <u>Director, Plastics Recycling and Waste Tire Recycling Projects (May 2019-June 2022):</u> <ul style="list-style-type: none"> - An externally-funded, multidisciplinary initiative of \$2,250,000.00 involving 5-6 faculty from School of Engineering & Applied Sciences, School of Management and College of Arts and Sciences. • <u>Director, Laboratory for Heteroepitaxial Growth of Functional Materials and Devices, UB (July 2021 – date).</u> • <u>Founding Director, The RENEW Institute, University at Buffalo (UB) (January 2015-July 2021):</u> <ul style="list-style-type: none"> - One of the most <i>expansive internally-funded</i> initiatives launched by UB or SUNY-Buffalo in recent years, RENEW (Research and Education in eNergy, Environment and Water) is a multidisciplinary initiative that harnesses the expertise of more than 100 faculty members across seven schools and colleges. The RENEW Institute is an outcome of the UB 2020 vision to position UB as one of the top research universities, fashioning an institution that will lead and shape the world in the 21st century. RENEW brings together researchers from

	<p>across the university to address society's toughest challenges and carry out transformative educational, research, creative and community engagement activities. It is a university-wide, multidisciplinary research institute that focuses on complex energy and environmental issues, as well as the human, social and economic issues with which they are connected and was launched with a commitment of \$15M using internal funds by the university.</p> <ul style="list-style-type: none"> - The original Director position was a <i>senior UB Leadership search</i>¹⁹ and was <i>positioned administratively at the level of the Deans</i>. It cut across seven schools and colleges including the School of Architecture and Planning, College of Arts and Sciences, School of Engineering and Applied Sciences, Law School, School of Management and School of Public Health and Health Professions and the School of Medicine and Biomedical Sciences. The RENEW Institute was positioned to promote <i>convergent research</i> by integrating knowledge, methods, and expertise across these seven diverse schools and colleges with numerous academic and scientific disciplines to catalyze scientific discovery and innovation. - As Director, was responsible for all aspects of the Institute including research portfolio, educational impact, HR, fund-raising, ES&H, distinguished lecture series, etc. - Led the Institute's formative strategic planning process and engaged over 100 faculty across seven schools. Five multidisciplinary focus areas spanning Energy, Environment and Water were chosen and the institute's overall goal established. - Engaged with Deans of seven schools related to inter-, trans- and multi-disciplinary activities and w.r.t. hiring of faculty in the seven schools. All faculty hiring was a partnership with the Deans since all faculty had a tenure home in one of the departments in the seven schools and colleges. - The Institute had 19 allocated faculty slots for hiring multidisciplinary faculty across seven schools and colleges. During my term as Founding Director, the Institute hired 15 exceptional, "<i>T-shaped</i>", multidisciplinary faculty, with specific area of expertise targeted to fill scientific/technical gaps identified during the Institute's strategic planning across the seven schools and colleges. - During my term as Founding Director, the institute also attracted and hired 4 outstanding, "<i>T-shaped</i>", multidisciplinary, senior research scientists with functional expertise in areas that were viewed necessary for multidisciplinary research across focus areas and disciplines, filling a need which could not be met by faculty hiring. This has resulted in the implementation of a <i>hybrid</i> academia/national laboratory model to enable and realize a multidisciplinary positioning. - As Director, competitively obtained funding for establishing four, senior named professorships for the Institute, referred to as <i>SUNY Empire Innovation Professors</i>. The funds for the SUNY Empire Innovation (EIP) program to attract the best and brightest to NY are competed across the 64 universities / institutions comprising the SUNY system and the many programs, schools and colleges within each of them. All four EIP professors were hired prior to 07/2021. - During my term as Founding Director, RENEW implemented an array of mechanisms to actively engage faculty across disciplines and units, resulting in new partnerships between disparate faculty to address interdisciplinary challenges in energy, environment and water. These include – (i) RENEW strategic seed investment grants, (ii) RENEW distinguished lecture series, (iii)
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¹⁹ The RENEW Director search in 2014 was a senior UB leadership search (<http://www.buffalo.edu/leadership-searches.html>).

	<p>RENEW focus area meetings, (iv) RENEW innovation lecture series, (v) RENEW ideation sessions, (vi) RENEW external grant opportunity list, (vii) Coffee with RENEW, and (ix) RENEW social media channels. To further elaborate on one successful initiative - RENEW has awarded 20 SEED investment grants to interdisciplinary faculty teams. Over 60 faculty across seven UB schools and colleges have received funding from this Institute initiative to engage in transformative, interdisciplinary research and this is resulting in the development of numerous external grant proposals, publications and presentations.</p> <ul style="list-style-type: none"> - During my term as Founding Director, the Institute directly or indirectly accomplished the following with a total investment of \$5,169,362.96 of Provost's funds from January 2015 to July 2021: <ul style="list-style-type: none"> - Assisted with development of <i>over 400 external research grant proposals</i>, and enabled research resulting in <i>over 600 publications</i> and <i>over 400 presentations</i>. - Resulted in garnering <i>over \$50 Million in external funds</i>. - Established cutting-edge, 21st century, <i>RENEW Shared Instrumentation Laboratories</i>. These are co-inhabited, shared, laboratories between faculty hired as RENEW faculty to encourage and spur multidisciplinary collaborations. These laboratories house second-to-none capabilities in the following areas – (a) Controlled heteroepitaxial advanced film synthesis of a variety of advanced materials; (b) Advanced, cutting-edge characterization capabilities and (3) Advanced device fabrication capabilities. These advanced facilities did not exist at UB and this presented a significant barrier to cutting-edge experimental work in the areas of energy, environment and water as well as in synthesis of electronic and quantum materials and devices. The RENEW Shared Instrumentation Laboratories serve as a model of how experimental facilities at the University. - Engaged over 100 faculty across the campus. - Initiated external engagement with the City of Buffalo on a sponsored project of ~ \$2 Million to help implement NY's Five Cities Energy Plan to make NY more renewable and to make the Buffalo Sewage Authority and the Water Treatment Plant more energy-efficient and renewable. The completion of the NY's Five Cities Energy Plan for Buffalo was marked by a <i>ceremony</i> at City hall with speeches from then Lieutenant Governor Kathy Hochul²⁰, New York Power Authority Chairman John R. Koelmel, President Gil C. Quiniones, Buffalo Mayor Byron Brown and RENEW Director Dr. Amit Goyal. - As part of its educational objectives, from 1/2015-07/2021, RENEW Institute faculty developed over 50 new, multidisciplinary educational courses in diverse topics such as Global climate change, Environmental Sociology and Next-generation Nanosensors. RENEW staff scientists also assisted in the development of a Certificate on Sustainability and RENEW-affiliated faculty offered an international summer course coordinated by RENEW. - Established the RENEW Institute's signature <i>Distinguished Lecture Series</i> which has become an established and prestigious lecture series and has been very well received by the university and local community. Over 100 people from the local community attended these distinguished lectures. <p>Was awarded the UB President's Medal in 2019, which recognizes "<i>outstanding scholarly or artistic achievements, humanitarian acts, contributions of time or</i></p>
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²⁰ Presently NY Governor.

treasure, exemplary leadership or any other major contribution to the development of the University at Buffalo and the quality of life in the UB community.” This is the highest recognition given at the university.

- **SUNY Empire Innovation Professor and SUNY Distinguished Professor (2015-date):**

- The State University of New York (SUNY) is the largest comprehensive university system in the United States²¹. SUNY’s impact in New York State and across the globe begins with our 64 institutions, including research universities, academic medical centers, liberal arts colleges, community colleges, colleges of technology and an online learning network. SUNY serves nearly 1.3 million students, including nearly 600,000 in credit bearing courses and programs and more than 700,000 through continuing education and community outreach programs. SUNY’s nearly 3 million SUNY alumni are located around the globe.
- The *SUNY Empire Innovation Professor* Program is designed to attract exceptionally distinguished faculty to the State of New York²². EIP researchers are leaders in their field. They are involved in groundbreaking research with a vision of growth for SUNY and their respective fields. Faculty bring experiential research opportunities to life through dynamic partnerships with fellow faculty, researchers and students. Not only do their contributions boost the vibrancy and diversity of campus communities, they enhance the forefront of knowledge, health, and economic vitality of New York State. The EIP program is designed to leverage existing campus resources and human capital to grow SUNY’s capacity as the go-to partner for state, federal, industrial and philanthropic research support in areas that address pressing state and global challenges.
- The *SUNY Distinguished Professorship* is conferred upon faculty having achieved national or international prominence and a distinguished reputation within the individual’s chosen field through significant contributions to the research and scholarship, or through artistic performance or achievement in the fine and performing arts. Appointments to this *SUNY system-wide distinguished title* are made by the SUNY Board of Trustees upon the recommendations of the campus chief administrative officer and the SUNY Chancellor. Distinguished faculty are expected to function as role models and devote appropriate service to University-wide activities, both ceremonial and professional, such as offering lectures and seminars, informing curricular reform, improving the overall academic experience of students, mentoring junior faculty, and leading inquiry into issues of importance to SUNY and society²³.
- Served in a leadership role of Chair of the School of Engineering & Applied Sciences (SEAS) Grievance Committee (that addresses concerns from students).
- Serve on the Dean’s Committee of Dean’s Committee of SUNY Distinguished Professors.

- **President & CEO and Financial Head (2010-date):**

- Experience as senior administrator of two companies (TapeSolar Inc. and TexMat LLC) and responsible for all administrative and financial functions. Experience with entrepreneurship and startup of new entities.
- Experience in interacting with private equity firms such as venture capital firms and angel investors. TapeSolar Inc. is a private equity investment funded company with offices San Marcos, TX. TapeSolar is developing the next generation photovoltaic technology. TexMat LLC is an IP holding company.

²¹ <https://www.suny.edu/about/>

²² <https://www.suny.edu/eip/>

²³ <https://www.suny.edu/Distinguished-Academy/>

- **Chair of the Corporate Fellows Council, Oak Ridge National Laboratory (2009-2014):**
 - As Chair of the Corporate Fellows Council, advised ORNL senior management / leadership on specific scientific and technological issues and opportunities, served as a channel for communication between ORNL scientific and technical staff and ORNL senior management and articulated ideas and concerns of the ORNL scientific and technical staff regarding objectives and directions of the Laboratory.
 - ORNL is Department of Energy's (DOE's) largest and most diverse multiprogram research laboratory, with an annual budget in excess of \$2 billion and has more than 5,000 staff.
 - Corporate fellows are a select group of highly accomplished individuals and characterize innovation, dedication, and significance of extraordinary contributions to research and development at Oak Ridge National Laboratory / UT-Battelle.
 - Was awarded DOE's Ernest Orlando Lawrence Award. This is awarded on behalf of the President of the United States by the US Department of Energy Secretary to outstanding scientists. This award in the inaugural category of Energy Science and Innovation recognizes transformative accomplishments related to DOE's investments in "use inspired" scientific research to develop new understanding, methodologies and materials required to advance, promote, and enable energy innovation. The Ernest Orlando Lawrence Award was established in 1959 in honor of the Nobel winning scientist who helped elevate American physics to world leadership. Only Lawrence Award Winner that was invited by Secretary Chu to give the first-ever science lecture at USDOE (<http://www.osti.gov/sciencecinema/biblio/1043697>).
- **Over twenty-five years project management and administrative experience (1993-to date):**
 - Distinguished Scientist and Corporate Fellow at ORNL.
 - Served as principal investigator in managing technical projects of a diverse nature and involving multiple organizations. Over the years have worked as Principal Investigator / Overall Manager on projects with most major US companies with interests in HTS and electric power applications, including General Electric Corporation, 3M Corporation, Intermagnetics, American Superconductor Corporation, SuperPower Inc., Oxford Superconductivity, Southwire Cable Company, Westinghouse Science & Electric, Midwest Superconductivity, Microcoating Technologies, Jet Deposition Technologies, Illinois Superconductor, Plastronics and EURUS.
 - Have served as Principal Investigator / Manager in projects with NanoSolar Inc., Global Solar Inc., Ampulse Inc. and Grid Logic.
 - Experience in putting together large consortia proposals to funding agencies. An example being the \$50M consortia proposal involving ~ 20 organizations including 15 companies and several universities and national laboratories in two countries.
- **Superconducting Wire Research Co-Ordinator (2007-2011):**
 - Provided overall research co-ordination of all HTS wire research projects at Oak Ridge National Laboratory funded by the Department of Energy's Office of Electricity (OE) Program Office. At its peak, the HTS program at ORNL was ~ \$15-20M/year and involved 25-30 people including postdoctoral fellows and students.
 - Significant experience in developing and building impenetrable intellectual property portfolios.
 - Experience in working with and defending intellectual property in interference

	<p>cases at the European Patent Office.</p> <ul style="list-style-type: none"> • <u>Task Manager, Superconducting Materials Research, Metals & Ceramics Division (2004-2007):</u> <ul style="list-style-type: none"> - Provided technical leadership, oversight, and coordination of all HTS materials research projects in the M&C Division funded by the DOE/OETD Superconductivity program. Coordinated M&C input to the Field Work Proposal and to the annual DOE peer review, as well as M&C input for DOE quarterly and annual reports. - In partnership with program management, prioritized existing and proposed new 2G and strategic wire research projects in M&C Division and coordinated periodic internal progress report meetings. Coordinated M&C involvement in joint projects involving industry, universities, and/or other ORNL divisions. Managed 2G and strategic HTS materials research project budgets within the M&C HTS Materials Projects team, in consultation with program and divisional management. • <u>Task/Technical Leader, Superconducting Materials Team, Metals & Ceramics Division (2001-2007):</u> <ul style="list-style-type: none"> - Provided technical leadership for all projects performed by the HTS Task team in the Functional Materials Group. - Developed a research agenda for the task team, consistent with the goals, mission and strategic plan of the HTS program. Ensured communication among all members of the task team, divisional management, on topics of interest, and issues of importance, via one-on-one meetings, task group meetings, emails etc. - Addressed ES&H issues of importance. Managed cost spending within available budgets. - Mentored and guided task team members to grow professionally and set goals for task team members that will be challenging and will contribute to the goals of the task team, the group and the division. - Managed space that is assigned to the task team. Maintained clean laboratories and compliant research equipment. Ensured maintenance of updated RSS's to reflect all equipment and work of the respective task team laboratories. Maintained sufficient funding for the task team and its activities.
<div>Scientific and Technology Focus</div>	<p>Significant scientific expertise and experience in the following technical areas:</p> <ul style="list-style-type: none"> • Electronic materials in general and in particular high temperature superconducting materials • Photovoltaics – fabrication of low-cost, high efficiency solar cells • Ferroelectrics/dielectrics, high-density magnetic storage • Roll-to-roll deposition technologies including PVD, CVD and chemical solution deposition • Thin film and thick film growth of devices by physical vapor deposition, chemical vapor deposition and solution growth methods • Low-cost, single-crystal-like substrate technologies • Self-assembly of nanodots and nanorods of one phase within another, e.g. for pinning sites within a superconducting film (<i>Science</i>, 311, 1911-1914, 2006) • Self-assembly of nanofences containing single-crystal nanobelt segments • Controlled synthesis of aligned nanorods, etc. • Microstructure – Property – Processing at all length scales. • Materials science & engineering in general
<div>Awards of Excellence and</div>	<ul style="list-style-type: none"> • <u>2021 Global Energy Prize Finalist.</u> The Global Energy Prize is an international award in the field of energy industry which is given for "<i>outstanding scientific research and scientific-technical developments in the field of energy which promote</i>

**Select Key
Recognitions**

greater efficiency and environmental security for energy sources on Earth in the interests of all mankind". According to IREG Observatory on Academic Ranking and Excellence, the Global Energy Prize is one of TOP-99 international academic awards with the highest prestige and significance²⁴. It was been referred to as "a Russian analogue²⁵ to the Nobel prize".

- **2021 Fellow, Institute of Electrical and Electronics Engineers (IEEE).** The designation is conferred by the IEEE Board of Directors upon people with an outstanding record of accomplishments in IEEE fields of interest. The total number selected in any one year cannot exceed one-tenth of 1 percent of the total voting membership. IEEE fellow is the highest grade of membership.
- **2019 President's Medal, University at Buffalo (UB).** The UB President's Medal, first presented in 1990, recognizes "*outstanding scholarly or artistic achievements, humanitarian acts, contributions of time or treasure, exemplary leadership or any other major contribution to the development of the University at Buffalo and the quality of life in the UB community.*" This is among the highest recognitions given at the university. To date, there have been only 35 University at Buffalo *President's Medal* Recipients.
- **2018 Member, National Academy of Engineering (NAE).** Elected Member of the National Academy of Engineering, USA for "*For materials science advances and contributions enabling commercialization of high-temperature superconducting materials.*" Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to "engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature" and to "the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."
- **2017 R&D100 Award** for developing the technology titled "*High-Performance, low-cost, flexible, single-crystal-like, GaAs-based Thin Film Transistors*".
- **2016 R&D100 Award** for developing the technology titled "*Low-Cost, Flexible, Single-Crystal-Like, Large-Area, CdTe Substrates For Epitaxial Electronic & Electrical Devices*".
- **2015 Fellow, National Academy of Inventors (NAI).** Elected Member and Fellow of the National Academy of Inventors, USA for "*having demonstrated a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development and the welfare of society.*" Included among all NAI Members and Fellows are 61 presidents and senior leadership of research universities and non-profit research institutes, 208 members of the other National Academies (NAS, NAE, IOM), 21 inductees of the National Inventors Hall of Fame, 16 recipients of the U.S. National Medal of Technology and Innovation, 10 recipients of the U.S. National Medal of Science and 21 Nobel Laureates.
- **2013 R&D100 Award** for the technology titled "*Large-Area, Flexible, Single-Crystal-Like, GaAs Substrates For Epitaxial Electronic & Electrical Devices*".
- **2012 World Technology Award in the Category of "Advanced Materials".** The prestigious World Technology Awards are presented by the World Technology Network (WTN) in association with *Time, Fortune, CNN, Science/AAAS* and *MIT's Technology Review Magazine* with a stated goal to recognize "*individuals and companies for innovations of the greatest long-term significance*" in their respective fields. Winners were announced in 10 corporate categories and 20 individual

²⁴ <https://ireg-observatory.org/en/wp-content/uploads/2019/12/ireg-list-academic-awards.pdf>

²⁵ https://en.wikipedia.org/wiki/Global_Energy_Prize

categories including the Arts, Biotechnology, Communications, Energy, Environment, Finance, Health & Medicine, IT, Materials, Law, Policy, Space, among others. The 2012 World Technology Awards were announced in a black-tie awards ceremony at the Time & Life Building in Manhattan, NYC on Oct. 23, 2012. *Other World Technology Award recipients in the category of Materials include Nobel Laureate Alan Heeger (2013) and in previous years George Whitesides, Frederick Seitz, Michael Graetzel, Charles Lieber and Angela Belcher.*

- **2012 R&D100 Award** for developing the technology titled “*Highest Pinning Force, High-Temperature Superconducting Wires with Double-Perovskite Tantalate Nano-Pinning Centers*”.
- **Fellow, Materials Research Society (MRS), February 2012.** The title of MRS Fellow honors those MRS members who are notable for their distinguished research accomplishments and their outstanding contributions to the advancement of materials research, world-wide. The maximum number of new Fellow appointments each year is limited to 0.2% of the current MRS membership. The distinction is highly selective.
- **2011 DOE’s E. O. Lawrence Award for “Energy Science & Innovation”.** The E. O. Lawrence award is awarded on behalf of the *President of the United States by the US Department of Energy Secretary* to outstanding scientists. This award in the inaugural category of Energy Science and Innovation recognizes transformative accomplishments related to DOE's investments in "use inspired" scientific research to develop new understanding, methodologies and materials required to advance, promote, and enable energy innovation. *The Ernest Orlando Lawrence Award was established in 1959 in honor of the Nobel winning scientist who helped elevate American physics to world leadership.* Only Lawrence Award Winner that was invited by Secretary Chu to give the first-ever science lecture at USDOE (<http://www.osti.gov/sciencecinema/biblio/1043697>).
- **2011 National Federal Laboratory Consortium Excellence in Technology Transfer Award** for the technology titled – “*Flexible Thin-Film Crystalline-Silicon Photovoltaics*”.
- **2011 R&D100 Award** for developing the technology titled “*Ultra-high Density Storage Media*”. The product is the first report of successful fabrication of a 1 Tb/in² storage media made using a process of nanoscale self-assembly.
- **2010 R&D100 Magazine’s “Innovator of the Year” Award:** The “Innovator of the Year” Award is given for collective lifetime contributions. *Among the other 9 past recipients of this honor are Larry Page (co-founder of Google), Elon Musk (Inventor of PayPal, Tesla) and Dean Kaman (inventor of the Segway).* Widely recognized as the “Oscars of invention”, the R&D100 awards are given to the most innovative products developed in any field world-wide in that calendar year.
- **2010 R&D100 Award** for developing the technology titled “*High-Performance, High-T_c Superconducting Wires enabled via Self-assembly of Non-superconducting Columnar Defects*”. The product is an ultra-high performance HTS Wire in which the performance has been significantly enhanced by the creation of self-assembled, nanoscale, non-superconducting columnar defects. Most high-performance HTS wires fabricated world-wide use this technology.
- **2010 R&D100 Award** for developing the technology titled “*Flexible, Large-area, Single Crystal-like, Si-based Semiconductor Substrates*”. This technology allows fabrication of low-cost, large-area (kilometer-long and meter wide), single-crystal-like substrates having a heteroepitaxially grown, single-crystal-like semiconductor surface. Flexible Si can be used for fabricating many devices such as low-cost, high-efficiency solar cells. A Battelle Ventures funded, startup company, Ampulse Inc. was formed to attempt commercialization of crystalline Si-based solar cells based on this technology.
- **2010 ASM-IIM Lectureship Award:** ASM-IIM (American Society of Metals -

Indian Institute of Metals) Visiting Lecturers are Ambassadors-at-large of ASM International to the materials community in India. The ASM-IIM visiting lectureship program, established in 1979, is intended to promote international cooperation between ASM International and the materials community in India.

- **2009 R&D100 Award** for developing the technology titled “*Superconducting “Wires” by Epitaxial Growth on SSIFFS™*”. The product is a “round” or low-aspect ratio, flexible, single-crystal, high-temperature superconducting wire with high performance for wide-ranging applications. This is the only 3rd generation HTS wire technology world-wide.
- **2009 Distinguished Alumnus Award** from the Indian Institute of Technology (IIT), Kharagpur, India. IIT Kharagpur is the oldest of the famous IIT’s and has a long list of very distinguished alumnus. Two other people also receiving this honor from IIT in 2009 include the CEO and Managing Director of Tata Motors Ltd., India (Tata Motors is the largest automobile manufacturer in India and also owns Land rover and Jaguar) as well as the President and Managing Director of Texas Instruments, India.
- **Fellow, World Technology Network (WTN) July, 2009.** The World Technology Network (WTN) is a global meeting ground, a virtual think tank, and an elite club whose members are all focused on the business and science of bringing important emerging technologies of all types (from biotech to new materials, from IT to new energy sources) into reality. The WTN's membership is comprised of approximately 1000 members from more than 60 countries, judged by their peers to be the most innovative in the technology world. Most fellows in the “Materials” category are well-known and many are members of NAE and/or NAS.
- **2008 Nano50™ Innovator Award:** This award recognizes individuals who are leaders or pioneers in a specific area of nanotechnology and having a significant background of accomplishments in advancing the state of the art. The recognition was given for contributions to self-assembly of nanomaterials to form novel nanocomposites. His research was the first to demonstrate 3D self-assembly of one complex oxide material within another complex material. Developed with LDRD and DOE support, this self-assembly process was used to create insulating columns of non-superconducting materials within superconducting wires to significantly enhance their performances in high applied magnetic fields.
- **Fellow, APS. Elected Fellow of the American Physical Society (APS) Nov., 2008.** The APS is the world’s leading physics society and is a leader in advancing and disseminating the knowledge about Physics. Less than one-half of one percent of the APS membership is elected for Fellow status.
- **2008 National Federal Laboratory Consortium Excellence in Technology Transfer Award** for the technology titled – “*High-Performance LaMnO₃-Enabled, High-Temperature Superconducting Tape*”. This national level award is given for advancing technologies from the laboratory to the marketplace. The award was again in collaboration with SuperPower Inc. located in Albany, NY.
- **2007 “Pride of India” Gold Award:** Sponsored by the NRI Institute, the award recognizes people of Indian origin around the world for outstanding achievements in their chosen fields. It also recognizes public service contributions toward the economic development of India and their country of residence. The NRI Institute is an international NGO of Indians, Non-resident Indians (NRI’s) and Persons of Indian Origin (PIO’s) with chapters world-wide in India, America, Europe, Asia, Middle-east and Australia. Award recipients were chosen from leaders, pioneers and professionals world-wide from the fields of Technology, Medicine, Business Management, Legal, Creative Arts, Public Service, or Academia. Non-Resident Indians (NRI’s) or People of Indian Origin (PIO’s) who serve as an inspiration to fellow NRIs, and who are recognized as pioneers in their professions were selected. Over 400 leaders in business, government, and education from all over the world attended the awards gala held at the Marriott Hotel in North Bethesda, MD on Sept.

	<p>28, 2007 and the award was bestowed by the <i>Indian Ambassador</i> to the USA. Many other notable guests were present including a member of India's Parliament, the President of the US-India Business Council as well as representatives from the local Congressman's office.</p> <ul style="list-style-type: none"> • <u>2007 MICRO/NANO 25 Award</u> from the R&D100 magazine for developing the technology titled "<i>Nanocomposites via Epitaxial, 3-D Self-Assembly of Nanodots of One Complex Material within Another</i>". The MICRO/NANO 25 awards are given to the most innovative micro/nano technologies or products developed in any field world-wide in that calendar year. The award winning products, processes, and innovations were those groundbreaking technologies likely to have a large impact on their specific industries and society. • <u>2007 R&D100 Award</u> for developing the technology titled "<i>High-performance LMO-Enabled High-temperature Superconducting Wire</i>". The award was in collaboration with SuperPower Inc. located in Albany, NY. • <u>2007 Southeast Federal Laboratory Consortium Excellence in Technology Transfer Award</u> for the technology titled – "<i>High-Performance LaMnO₃-Enabled, High-Temperature Superconducting Tape</i>". The award was again in collaboration with SuperPower Inc. located in Albany, NY. • <u>Fellow, ACERS. Elected Fellow of the American Ceramics Society (ACERS) May, 2007.</u> The American Ceramic Society is a global leader among professional organizations in supporting scientific research, emerging technologies, and current applications, in which ceramic materials are a key element. Election to Fellow status is quite selective. • <u>2006 Rochester Distinguished Scholar Medal</u> from the University of Rochester²⁶, NY. Given by the university to graduates who have had distinguished careers, most often in academia, industry or government. <i>Over the years there have less than 25 named Rochester Distinguished Scholars.</i> This award was bestowed at the 2006 Annual Commencement at the University of Rochester on May 20th and the recipient was also requested to address the graduating class during the Annual Doctoral Commencement Ceremony. • <u>2006 Nano50 Award</u> for the technology titled "<i>The HTS Wires Enabled via 3D Self-Assembly of Insulating Nanodots</i>" presented by <i>Nanotech Briefs</i> magazine – the monthly digital publication from the publishers of <i>NASA Tech Briefs</i> – the Nano 50 recognizes the top 50 technologies, products, and innovators that have significantly impacted, or are expected to impact, the state of the art in nanotechnology. <i>Nanotech Briefs</i> magazine claims that the winners of the Nano 50 awards are the "best of the best" – the innovative people and designs that will move nanotechnology to key mainstream markets. Nano 50 nominations were judged by a panel of nanotechnology and MEMS experts. The technologies, products, and innovators receiving the 50 highest scores were named Nano 50 award winners. The award was given at the National Nano Engineering Conference in Boston, Nov. 9-10, 2006. • <u>2006 ORNL Inventor-of-the-Year Award</u> from Battelle Memorial Institute, Columbus, Ohio. Awarded on April 28, 2006 at the 2006 Battelle Annual Recognition and Reward Banquet, Columbus, Ohio. Was named a "Battelle Star" at the banquet. • <u>2006 ASM-IIM Lectureship Award:</u> ASM-IIM (American Society of Metals - Indian Institute of Metals) Visiting Lecturers are Ambassadors-at-large of ASM
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²⁶ The University of Rochester (located in Rochester, N.Y.) is one of the nation's leading private universities. The University which started in 1850, consistently ranks among the top colleges and universities nationwide in federally financed science, engineering, medical, and other research. In research productivity, the University ranks 12th among leading private universities nationwide. Rochester faculty and alumni have included eight Nobel Prize winners and 12 Pulitzer Prize winners. Rochester is a leading user and charter member in the University Research Association, which manages Fermilab, the world's highest-energy accelerator, in Batavia, Illinois.

International to the materials community in India. The ASM-IIM visiting lectureship program, established in 1979, is intended to promote international cooperation between ASM International and the materials community in India.

- **2006 Excellence in Technology Transfer Award** from UT-Battelle. This award was given for the development, patenting, and transfer of high throughput buffer layer technology being commercialized by SuperPower, Inc. involving ion-beam-assisted deposition, that enabled the achievement of world record performance in SuperPower's long-length second-generation superconducting wires.
- **2005 Award for Excellence in Science & Technology** from UT-Battelle, Dec. 2005. Citation of award was: "For establishing an intellectual property portfolio that has resulted in ORNL's world-wide dominance in high temperature superconducting wire fabrication."
- **2005 Global Indus Technovator Award** awarded by a group based at MIT, Boston. The Global Indus Technovator Awards have been instituted to recognize and felicitate 10 distinguished innovators of Indus origin (countries in South Asia) working at the cutting-edge of technology that may be harnessed for far-reaching applications.
- **Fellow, ASM. Elected Fellow of the American Society of Metals (ASM), July, 2005.** ASM International is a society whose mission is to gather, process and disseminate technical information. ASM fosters the understanding and application of engineered materials and their research, design, reliable manufacture, use and economic and social benefits. This is accomplished via a unique global information-sharing network of interaction among members in forums and meetings, education programs, and through publications and electronic media.
- **2005 Exceptional Accomplishment Award** from DOE for "Exceptional Performance" at the 2005 U.S. Department of Energy Superconductivity Program Review. Certificate signed by Mr. William Parks, Acting Director, Office of Electric Transmission & Distribution and Dr. James Daley, Manager, DOE Superconductivity Program.
- **Fellow IOP. Elected Fellow of the Institute of Physics (IOP), UK, July, 2005.** The Institute of Physics is a leading international professional body and learned society with over 37,000 members, which promotes the advancement and dissemination of a knowledge of and education in the science of physics, pure and applied. It has a world-wide membership and is a major international player in: scientific publishing and electronic dissemination of physics; setting professional standards for physicists and awarding professional qualifications; and promoting physics through scientific conferences, education and science policy advice.
- **2004 Exceptional Accomplishment Award** from DOE for "Exceptional Performance" at the 2004 U.S. Department of Energy Superconductivity Program Review. Certificate signed by Mr. William Parks, Acting Director, Office of Electric Transmission & Distribution and Dr. James Daley, Manager, DOE Superconductivity Program.
- **Outstanding Young Tennessean Award, 2004.** Awarded by the Tennessee Junior Chamber of Commerce to recognize people who have risen to the top of their chosen fields and now act as role models for America's youth. Past recipients of this award include former US Vice President Al Gore, Present Congressman Harold Ford from Memphis, Present Congressman Zack Wamp from Oak Ridge, Late Elvis Presley and many more.
- **Fellow, AAAS. Elected Fellow of the American Association for Advancement of Science, Oct. 2004.** The American Association for the Advancement of Science (AAAS) is an international non-profit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. Election to Fellow status is highly selective.
- **Fellow, WIF. Elected Consulting Fellow of the World Innovation Foundation**

	<p>(WIF), Oct. 2004. The WIF was founded by the late Nobel Laureate Dr. Glenn Seaborg, and the current President is Nobel Laureate Dr. Jerome Karle. The WIF is an international, multidisciplinary consultative research group that advises nations and their governments behind the scenes. There are currently about 2000 WIF members and fellows throughout the world, including 57 Nobel Laureates.</p> <ul style="list-style-type: none"> • Designated "Battelle Distinguished Inventor", <i>inaugural class</i>. Photograph and plaque put up in Battelle's Inventor's Hall of Fame, February 2003. Battelle distinguished inventors are chosen from all the national laboratories managed by Battelle for USDOE. • Exceptional Accomplishment Award from DOE for "Exceptional Performance" at the 2003 U.S. Department of Energy Superconductivity Program Review. Certificate signed by Mr. Jimmy Glotfelty, Director, Office of Electric Transmission & Distribution and Dr. James Daley, Manager, DOE Superconductivity Program. • DOE's Energy 100 Award in 2001 for developing the RABiTS Technology. These awards are for the finest 100 scientific accomplishments of the US Department of Energy since it opened its doors in 1977. Received a personal letter of congratulations from then U.S. Energy Secretary, Mr. Bill Richardson. • 2001 Federal Laboratory Consortium Award for excellence in technology transfer for the RABiTS technology. Received a personal letter of congratulations from our present Energy Secretary, Mr. Spencer Abraham. • 1999 Massachusetts Institute of Technology's, Technical Review, TR100 – Award. This was an award for top 100 young innovators worldwide in any field of high technology whose inventions may make a <i>significant impact to technology in the next millennium</i>. Also, included in the 1999 TR100 innovators are the founders of Netscape, Yahoo, Hotmail and many other successful internet and advanced technology startups. The TR100 were chosen by a committee comprising three Nobel Laureates, head of the NASDAQ Stock Exchange, several leading University Presidents, CEO's and Vice-Presidents of some leading multinationals and Senior Partners of leading Venture Capital firms in the Silicon Valley. • 1999 Inventor of the Year Award, Oak Ridge National Laboratory. This was for <i>sustained</i> innovative accomplishments over an extended period of time. • 1999 R&D 100 Award for developing the RABiTS Technology. R&D100 awards are given to the most innovative products developed in any field world-wide in that calendar year. • 1999 R&D Sustained Development Accomplishment Award, Oak Ridge National Laboratory. This is a <i>high</i> technical award given at ORNL. • 1999 American Museum of Science & Technology's "Tribute to Tennessee Technology" Award. Given to the most important and significant technologies developed in the Tennessee area. • 1999 R&D Significant Development Accomplishment Award, Oak Ridge National Laboratory. • 1997 Lockheed-Martin NOVA Award for technical achievement. NOVA is the <i>highest</i> corporate award given by Lockheed-Martin Corporation. • 1997 R&D Significant Technical Accomplishment Award, Oak Ridge National Laboratory.
<div>Service on Important Boards & Committees</div>	<ul style="list-style-type: none"> • Member, <i>National Academies</i> Committee on – "<i>Advising NSF on its Efforts to Achieve the Nation's Vision for the Materials Genome Initiative (DMREF)</i>," July 2021. • Member, <i>National Academies</i> Committee on – "<i>Developing the US Smart Manufacturing Plan</i>," a <i>congressional mandate</i> to the Dept. of Energy (DOE) Secretary in partnership with the National Academies, 2021. • Member, <i>External Advisory Board</i>, Texas Center for Superconductivity at the

	<p>University of Houston (TcSUH), since 2021.</p> <ul style="list-style-type: none"> • <u>Member</u>, University-wide <i>SUNY Honorary Degree Committee</i>, chaired by the SUNY System Provost, since 2021. • <u>Member</u>, <i>National Academies, National Materials & Manufacturing Board (NMMB)</i>, appointed in Nov. 2020. • <u>Member</u>, <i>National Academies Panel for Reviewing NIST Materials Measurement Laboratory</i>, since 2020. • <u>Member</u>, <i>External Advisory Board, Materials Science Program, University of Rochester</i>, since 2020. • <u>Member</u>, <i>National Academies Intelligence Science and Technology Experts Group</i>, since 2020. • <u>Member</u>, DOE's <i>E.O. Lawrence Award Selection Committee</i> (since 2019). • <u>Member</u>, <i>National Academies Panel on Reviewing U.S. Army Research Laboratory in Materials Science</i>, since 2018. • <u>Member</u>, <i>Scientific Advisory Board, Center for Nanomaterials at Argonne National Laboratory</i>, since 2017. • <u>Member</u>, <i>Fellows Advisory Committee, National Academy of Inventors (NAI)</i>, since 2017. • <u>Member</u>, <i>Technical Advisory Committee of NYS Pollution Prevention Institute (NYSP2I)</i>, 2016-2017. • <u>Member</u>, <i>Board of Governors for the New York Sea Grant</i>, since August 2015. • <u>Chair</u>, <i>Eugene P. Wigner Distinguished Lecture Series on Science, Technology & Policy Organization Committee</i>, Oak Ridge National Laboratory, 2013-2014. • <u>Chair</u>, <i>Liane Russell Distinguished Early Career Fellowship Committee</i>, Oak Ridge National Laboratory, 2013-2014. • <u>Chair</u>, <i>ASM's Edward Camille Memorial Lecture Committee</i> (2013-2015). • <u>Chair</u>, <i>ASM's Medal for Advancement of Research and Distinguished Life Membership Committee</i> (2012- 2013). • <u>Committee Member</u>, <i>ASM's Medal for Advancement of Research and Distinguished Life Membership</i> (2011-2015). • <u>Chair</u>, <i>ASM's Fellows Committee</i> (2011-2012). • <u>Committee Member</u>, <i>ASM's Fellow Committee</i> (2009-2012). • <u>Awards Committee Member</u>, <i>ASM's Edward Camille Memorial Lecture Committee</i> (2011 - 2013). • <u>Chair, Electronics Division</u>, <i>American Ceramic Society</i> (2011-2012). • <u>Awards Committee Member</u>, <i>ASM's Medal for Advancement of Research</i> (2011 - to date). • <u>Chair-Elect, Electronics Division</u>, <i>American Ceramic Society</i> (2010-2011). • <u>Vice-Chair, Electronics Division</u>, <i>American Ceramic Society</i> (2010-2011). • <u>Guest Editor</u>, Special Focused Issue of the <i>Journal of Materials Research</i>, January 2011 on "<i>Self and Directed Assembly of Materials</i>". • <u>Secretary, Electronics Division</u>, <i>American Ceramic Society</i> (2009-2010). • <u>Member, Executive Editorial Board</u> (2007-2010) of <i>NanoTech Briefs Magazine</i>. • <u>Panel of Judges R&D100 Awards by invitation (2000, 2001, 2002, 2003, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021)</u>. The R&D 100 Awards given by R&D magazine to recognize the most innovative 100 new technical products introduced in the world for the year in question. • <u>Chair and Vice-Chair, Corporate Fellows Council, UT-Battelle/Oak Ridge National Laboratory (2009-2014)</u>. The Corporate Fellows Council of Oak Ridge
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	<p>National Laboratory consists of the active ORNL staff members who have been designated corporate fellows and senior corporate fellows. The roles of the corporate fellows are (1) To articulate the ideas and concerns of the ORNL scientific and technical staff regarding objectives and directions of the Laboratory, (2) To advise ORNL management on specific scientific and technological issues and opportunities, and (3) To serve as a channel for communication between ORNL scientific and technical staff and ORNL senior management.</p> <ul style="list-style-type: none"> • <u>Invited Lecturer</u> for stand-alone, short course on superconductivity at the University of Talca, Chile, December 18-24, Chile, 2000. • <u>Member, Advisory Board</u> for the Materials Research Science & Engineering Center (MRSEC) of Excellence at Carnegie Mellon University (by invitation during years 1999, 2000).
<div>Service on</div> <div>Journal Boards</div>	<ul style="list-style-type: none"> • <u>Member, Board of Reviewing Editors, PNAS Nexus</u>, a National Academy journal with a focus on multidisciplinary engineering sciences, since October, 2021. • <u>Member, Editorial Board, Nature Magazine's Scientific Reports</u>, since April 2015. • <u>Guest Editor, Special Focused Issue of the Journal of Materials Research</u>, July, 2013 on "Frontiers in Thin-Film Epitaxy and Nanostructured Materials". • <u>Principal Editor, Journal of Materials Research (since 2002)</u> - The journal of Materials Research is widely recognized as one of the top journals in the area of Materials Science & Engineering. • <u>Member, International Editorial Advisory Board (since 2003)</u>, Journal of the Korean Institute of Applied Superconductivity and Cryogenics. This is a leading journal in superconductivity originating from South Korea. • <u>Associate Editor, Journal of the American Ceramic Society (since 2004)</u> – This journal is recognized as one of the top journals in the field of ceramics. (Associate Editor since 6/2004) • <u>Member, Advisory Board, Superconductor Science & Technology (2005-2012)</u> – This journal is recognized as one of the top journals in the field of superconductivity. The journal is published by the Institute of Physics, UK. • <u>Member, Advisory Board (since 2008) of the Journal "Recent Patents on Materials Science"</u>. This journal publishes review articles written by experts in materials science summarizing recent patents on novel materials/inventions/methods/techniques in material science and debuted in January 2008. The journal is published by Bentham Science Publishers, a leading international publisher of high quality scientific journals and books. Bentham currently publishes 79 titles in 24 disciplines of science. • <u>Technical Advisor</u> from the Superconducting Materials Committee for the TMS publication "Journal of Minerals, Metals and Materials (JOM)" for 93-95.
<div>Service on</div> <div>Conferences /</div> <div>Workshops</div> <div>Advisory</div> <div>Committees or as</div> <div>Organizer</div>	<ul style="list-style-type: none"> • <u>International Advisory Committee, "International Workshop on Coated Conductors for Applications" (CCA2021)</u> held at Moji, Kitakyushu, Japan, Oct. 12-15, 2021. • <u>Overall Co-Chair or Organizer, 2014 Fall MRS Meeting</u> held in Boston, December, 2014. • <u>International Advisory Committee, International Workshop on Coated Conductors for Applications" (CCA2014)</u> to be held at Jeju Island, S. Korea, Nov. 30 – Dec. 2, 2014. • <u>Co-Organizer of the 2014 RF Mehl Medal Symposium on Frontiers in Nanostructured Materials and their Applications</u> held at the 2014 TMS Meeting, Feb. 16-20, San Diego, CA. • <u>Co-Organizer of the 2012 "Electronic Materials & Applications (EMA) Conference,"</u> held Jan 18-20, Orlando, FL, 2012.

- **International Advisory Committee, "International Workshop on Coated Conductors for Applications" (CCA2012)** held at Hiedelberg, Germany, Nov. 14-16, 2012.
- **Co-Organizer** of the 2011 "Directed Self-Assembly of Materials MRS Workshop," held Sept. 28, 2011 - October 1, Nashville, TN, 2011.
- **Co-Organizer** of the 2011 Acta Met. Gold Award Special Focus Session, MRS Spring Meeting, San Francisco, April, 2011.
- **International Advisory Committee, "International Workshop on Coated Conductors for Applications" (CCA2010)** held at Fukuoka, Japan, Oct. 28-30, 2010.
- **Co-Organizer** of the Inaugural 2010 Electronic Materials and Applications (EMA2010) Conference held at Orlando, FL, Jan. 20-22, 2010.
- **Co-Organizer** of Symposium on Self-Assembly of Materials & Devices at the 2010 MRS Spring Meeting, San Francisco, CA, April 5-9, 2010.
- **International Advisory Committee, "International Workshop on Coated Conductors for Applications" (CCA2009)** held at Barcelona, Spain, Nov. 22-24, 2009.
- **International Advisory Committee, "International Workshop on Coated Conductors for Applications" (CCA2008)** held at Houston, TX, Dec. 4-6, 2008.
- **Co-Organizer** of the 15th International Conference on the Textures of Materials (ICOTOM) Organized by The American Ceramic Society and The Minerals, Metals & Materials Society (TMS), June 1-6, 2008, Carnegie Mellon University Center - Pittsburgh, Pennsylvania, USA.
- **Co-Organizer** of the 2007 International Workshop on Coated Conductors held in Jeju Island, S. Korea from November 8-10, 2007.
- **Co-Organizer** of Symposium on Basic and Applied Needs for Superconductors at the Materials Science & Technology International Conference & Exhibition (MS&T 2007), held September 16-20, in Detroit, MI, 2007.
- **Co-Organizer** of the 2006 International Workshop on Coated Conductors held in Ludwigsburg, Germany from July 2-6, 2006.
- **Co-Organizer** of Symposium on High-Temperature Superconducting Wires and Tapes at the Materials Science & Technology International Conference & Exhibition (MS&T 2006), held October 15-19, 2006 in Cincinnati, OH.
- **Co-Organizer** of Symposium on Microstructural & textural requirements for Functional Materials at the Materials Science & Technology International Conference & Exhibition (MS&T 2006), October 15-19, 2006 in Cincinnati, OH.
- **Co-Organizer** of a US-Japan Workshop on High Temperature Superconductors at the PACRIM Meeting, Maui, Hawaii, 2005.
- **Co-Organizer** of Symposium titled "Epitaxial Growth of Oxides, Nitrides, Borides and Carbides," 107th Annual Meeting & Exposition of the American Ceramic Society, April, 2005, Baltimore, MD.
- **Co-Organizer** of the 2004 International Workshop on Coated Conductors held in Tokyo, Japan in November, 2004.
- **Co-Organizer** of Symposium titled "Synthesis, Properties, and Crystal Chemistry of Perovskite Based Materials," 106th Annual Meeting & Exposition of the American Ceramic Society, April 18-21, 2004, Indianapolis.
- **Co-Organizer** of Symposium titled "Epitaxial Growth of Functional Oxides," 204th Annual Meeting of the Electrochemical Society," October 12-17, 2003, Orlando, FL.
- **Co-Organizer** of Symposium titled "High Temperature Superconductor Processing", at the 105th Annual Meeting & Exposition of the American Ceramic

	<p>Society, April 27-30, 2003, held in Nashville, TN.</p> <ul style="list-style-type: none"> • <u>Co-Organizer</u> of the 2002 International Workshop titled "International Workshop on Processing and Applications of Superconductors", Gatlinburg, TN, August 1-2, 2002. • <u>Co-Organizer</u> of Symposium titled "High Temperature Superconductor Processing", at the 104th Annual Meeting & Exposition of the American Ceramic Society, held in St. Louis, MO, April 28-May 1, 2002. • <u>Co-Organizer</u> of Symposium on High Temperature Superconductors at the 2002 TMS Annual Spring Meeting. • <u>Co-Organizer</u> of Symposium titled "Processing of Long Lengths of Superconductors", at the 1993 TMS Annual Fall Meeting, held in Pittsburgh, PA, Oct. 17-21. • <u>Guest Editor</u>, Special Issue of High-T_c Superconductors, <i>Journal of Minerals, Metals and Materials (JOM)</i>, August Issue, 1995. • <u>Guest Editor</u>, Special Issue of High-T_c Superconductors, <i>Journal of Minerals, Metals and Materials (JOM)</i>, December Issue, 1994. • <u>Session Chairman</u> at numerous symposia in the following conferences from 1992-2013: Materials Research Society (MRS), Technical Materials Society (TMS), American Physical Society (APS), International Cryogenic Materials, Conference (ICMC), Applied Superconductivity Conference (ASC), International Workshop on Critical Currents (IWCC), US-Japan Workshop on High Temperature Superconductivity, International Conference on Textures in Materials (ICOTOM).
<div>Patents- Summary</div>	<ul style="list-style-type: none"> • Over 150 patent applications and/or invention disclosures filed. • <u>88 issued patents</u> (70 US and 18 International patents). • <u>70 US patents issued to date:</u> US Patent Nos. 5, 739, 086; 5, 741, 377; 5, 846, 912; 5, 898, 020; 5, 964, 966; 5, 958, 599; 5, 968, 877; 6, 077, 344; 6, 106, 615; 6, 114, 287; 6, 150, 034; 6, 156, 376; 6, 151, 610; 6, 159, 610; 6, 180, 570; 6, 235, 402; 6, 261, 704; 6, 270, 908; 6, 331, 199; 6,375,768; 6, 399, 154; 6, 451, 450; 6, 447, 714; 6, 440, 211; 6, 468, 591; 6, 486, 100; 6, 599, 346; 6, 602, 313; 6, 607, 313; 6, 607, 838; 6, 607, 839; 6, 610, 413; 6, 610, 414; 6, 635, 097; 6, 645, 313; 6, 663, 976; 6, 670, 308; 6, 675, 229; 6, 716, 795; 6, 740, 421; 6, 764, 770; 6, 784, 139; 6, 790, 253; 6, 797, 030; 6, 846, 344; 6, 782, 988; 6, 890, 369; 6, 902, 600; 7, 087, 113; 7, 258, 928; 7, 510 997; 7, 683, 010; 7, 879 161; 7, 906, 229; 7, 919, 435; 8, 034, 745; 8, 119, 571; 8, 178, 221; 8, 210, 420; 8, 227, 082; 8,424,745; 8,481,460; 8, 518, 526; 8, 536, 098; 8, 685, 549; 8, 748, 349; 8, 748, 350; 8, 795, 854; 8, 987, 736, 8, 993, 092. • <u>18 international patents issued to date:</u> Australian Patent No. 8349510, Australian Patent No. 713982, Canadian Patent No. 2,217,822, Japanese Patent No. 03601830, European Region Patent No. EP 0830218, South Korea Patent No. 418279, Switzerland Patent No. 0830218, Germany Patent No. 0830218, Spain Patent No. 0830218, France Patent No. 0830218, Great Britain Patent No. 0830218, Italy Patent No. 0830218, Sweden Patent No. 0830218, Hong Kong Patent HK 1150093, Chinese Patent CN101981699, Chinese Patent CN1132585 and Indian Patent 310761. • <i>A majority of these issued patents have been licensed during the course of the last two decades.</i> • <i>Over 5 US patents presently pending.</i> • <i>Over 5 International patents pending.</i> • This is the <u>highest</u> number of issued US patents for any employee in the Battelle system (http://www.battelle.org/careers/battelle/about.stm). Battelle serves the U.S. Department of Energy in the management of four leading-edge national laboratories – Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Brookhaven National Laboratory (BNL) and National Renewable Energy

	Laboratory (NREL).
Publications- Summary	<ul style="list-style-type: none"> • 45 invited book chapters and publications. • <u>Over 360 publications in national and international journals and conference proceedings</u> in a wide selection of journals including Science, Nature Communications, Nature Magazine's Scientific Reports, Philosophical Magazine, Applied Physics Letters, Energy & Environmental Science, Physical Review B, Physics Review Letters, Physica C, Superconductor Science & Technology, Applied Superconductivity, Journal of Materials Research, Journal of Applied Physics, Science and Journal of Minerals, Metals & Materials, Cryogenics, Ultramicroscopy, Journal of American Ceramic Society, IEEE Transactions in Applied Superconductivity, Japanese Journal of Applied Physics, MRS Bulletin, Scripta Metallurgica, Materials Letters, Journal of Electronic Materials, Chemistry of Materials, Journal of Materials Science & Engineering, Materials Science Forum, Journal of Superconductivity and Nanomaterials. • <u>Over 8000 citations from first author and second author publications alone.</u> • <u>Total number of citations = over 18,756. (Google Scholar).</u> • <u>H-index = 68 (Google Scholar).</u> • <u>i10 = 317 (Google Scholar).</u> • An independent analysis of the field of high-temperature superconductors conducted by Thompson-Reuters's Essential Science Indicators (ESI) and ScienceWatch.com, which tracks global trends and performance in research, <i>Dr. Amit Goyal ranks no. 1 worldwide in the total number of citations during the last decade (1999-2009).</i> He also ranks no. 4 worldwide in the total number of papers published in same timeframe (this is still the highest number of papers by anyone outside of Japan). A recent interview with Amit is posted on ScienceWatch (http://archive.sciencewatch.com/ana/st/hts/09maySTHTSGoyal/). The analysis, conducted by ScienceWatch.com ranked authors, institutions, and countries worldwide by no. of citations, no. of papers, and average citations per paper.
Presentations- Summary	<ul style="list-style-type: none"> • <u>Over 25 invited plenary or keynote presentations in national and international conferences.</u> • <u>225 invited presentations</u> in national and international conferences. • <u>Over 350 presentations</u> in national and international conferences.
Books- Summary	<ul style="list-style-type: none"> • <u>Second Generation High-Temperature Superconducting Wires</u>, edited by A. Goyal, under contract by Kluwer Academic Publishers. (published Oct. 2005) • <u>Epitaxial Growth of Functional Oxides</u>, edited by A. Goyal and W. Wong-Ng, under contract by Kluwer Academic Publishers. (published Spring, 2005) • <u>Processing of Bulk, High-Temperature Superconducting Wires</u>, by A. Goyal, under contract by Plenum Publishing Corporation. (published Spring 2005) • <u>Processing of High Temperature Ceramic Superconductors</u>, edited by R. L. Meng, A. Goyal, W. Wong, M. Matsumoto and H. Freyhardt, published by the American Ceramic Society, 2004. • <u>Processing of High Temperature Ceramic Superconductors</u>, edited by A. Goyal, W. Wong, M. Murakami and J. Driscoll, published by the American Ceramic Society, 2003. • <u>Processing of Long Lengths of Superconductors</u>, edited by U. Balachandran, E. W. Collings and A. Goyal, TMS, Warrendale, PA, 1994.
Reviewer for Journals	<ul style="list-style-type: none"> • <u>Journals:</u> Nature Magazine's Scientific Reports, Nature, Science, Advanced Functional Materials, Advanced Materials, Physica C, J. Materials Research., Applied Physics Letters, Physical Review B, Physical Review Letters, J. Applied Physics, Applied Superconductivity, J. of Electrochemical Society, Materials Letters, J. of Metals, Minerals and Materials.

	<ul style="list-style-type: none"> • <u>SBIR</u>: Have reviewed many DOE and DARPA proposals for small business innovation research grants. • <u>NSF</u>: Member in panel of reviewers under the Ceramics Program. • <u>NSF</u>: Reviewer for the DMREF program. Reviewer for the COBASE program funded by the National Science Foundation (NSF) and administered by the Office for Central Europe and Eurasia of the National Research Council (NRC). The program provides grants to individual American specialists who plan to establish new research partnerships with their colleagues in Central/Eastern Europe (CEE) and the Newly Independent States of the former Soviet Union (NIS). This program is designed primarily to prepare these new partnerships for competition in NSF programs. • <u>NSF MRSEC review board</u> – Have reviewed proposals from leading research universities to establish Materials Science & Eng. Centers of Excellence with typical budgets in the range of \$ 5M for 5 years. • <u>R&D100 Awards</u>: Invited to be on the panel of reviewers for the 2000, 2001, 2002, 2003 and 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021 R&D100 awards. • <u>DOE Annual University Peer Review</u>: On the DOE panel of reviewers for 2000 Annual Peer Review for Universities to be held in Washington DC in July'2000. • <u>AFOSR University Funding Review</u>: Served as a reviewer for the Air Force's program for university funding in 2002.
<div>Advising /</div> <div>Mentorship</div>	<ul style="list-style-type: none"> • Have mentored over 20 postdoctoral fellows and scientific staff over the years. Most are doing very well professionally: <ul style="list-style-type: none"> - Sung-Hun Wee: Was staff scientist at ORNL. <i>Now Senior Staff Scientist</i> at Hitachi Research Laboratory in CA. - Sukill Kang: <i>Now Professor</i> at Chonbuk National University, S. Korea. - Beyong-Won Kang: <i>Now Professor</i> at Gwangju Institute of Science and Technology (GIST), S. Korea. - Keith Leonard: <i>Now Staff Scientist</i> at MSTD, ORNL. - Noel Rutter: <i>Now Faculty member</i>, University of Cambridge, UK. - S. Sirinivasan: <i>Now Staff Scientist</i> at American Superconductor (AMSC). - Darren Verebelyi: <i>Now Director</i> at Global Solar. - John Mathis: <i>Now Associate Professor</i> at Embry-Riddle Aeronautical University, Florida. - Junsoo Shin: <i>Now at Louisiana State University</i>, Louisiana. - Jing Li: <i>Now at North Carolina State University</i>, Raleigh, North Carolina. - Jaeeun Yoo: <i>Now at Korea Advanced Institute of Science and Technology</i>, S. Korea - Bianca Shaw: Was RENEW Fellow, University at Buffalo, NY, now Project Manager at New York State Energy and Research Development Authority (NYSERDA). - Edward Richter: Was RENEW Fellow, University at Buffalo, NY, now Associate Project Manager, TRC Inc., Buffalo, NY. - Kevin Meindl: Was RENEW Fellow, University at Buffalo, NY, now Landscape Architect at Buffalo Sewer Authority, Buffalo, NY. - Yves Mulowayi: Was RENEW Fellow, University at Buffalo, NY. - Susan Clark: Was RENEW Senior Scientist, Now Director, Sustainability in College of Arts & Sciences, University at Buffalo. - Michael Shelly: Presently RENEW Senior Scientist, University at Buffalo. - Eun Ju Moon: Presently RENEW Senior Scientist, University at Buffalo, now

	<p>Senior Scientist at Corning Research.</p> <ul style="list-style-type: none"> - Yi Zhang: RENEW Senior Scientist, University at Buffalo, now at Senior Technical Staff at Covalent Metrology, CA. - Zia Ahmed: Presently RENEW Senior Scientist, University at Buffalo. - Silvia Rasi: Presently at UB. - Guangyu Jiang: Joining UB in January 2022. <ul style="list-style-type: none"> • Previously mentored undergraduate student: <ul style="list-style-type: none"> - Nathan Moody: <i>Now Senior staff scientist</i> at LANL. Originally came to ORNL as part of a summer student group almost 15 years back. Then he returned to do a personal science project with me. The report and poster on this science project allowed him to represent the USA around the world and got him a full 4-year scholarship at the University of Maryland. He called me in April 2013, informing me that he went on to pursue higher studies and did a Ph.D in Electrical Engineering and was now was a scientist at LANL. He stated that he called in April 2013, because he had just accepted to work with summer students at LANL for the summer of 2013, and just wanted to call and say thanks because according to him it was this stint at ORNL which inspired him to pursue science and get a doctorate and become a scientist! He stated he was now hoping to do similar mentorship to affect the life of another student! • Previously mentored graduate students: <ul style="list-style-type: none"> - Yongli Xu: <i>Now Senior Staff Scientist</i> at Staff Scientist at Guardian Industries, Detroit, MI. • Mentored high school students and have given lectures in local high schools. • Mentored undergraduate students: Most recent - Nancy Perez and Richard Kinch, U. of Puerto Rico. • Has served as a judge in the Southern Appalachian Science and Engineering Fairs and the Canada Wide Virtual Science Fairs. • Mentored graduate students: Yongli Xu, Uni. Of Cincinnati; C. J. Simon, U. of Tenn.; E. Yang, U. of Wisconsin.
Funded Projects / Past Research Funding	<p><u>Total Funding:</u> Since 1991, received more than \$50M in research funding over the years.</p> <p><u>External Funds as PI at UB (over \$10M):</u></p> <ul style="list-style-type: none"> • <u>NYS State Center of Excellence in Plastics Recycling and Innovation</u>, NY Department of Energy Conservation (DEC) award. \$ 4,500,000.00, 2022-2025. Project Director and PI: A. Goyal. • <u>Defect-Engineering to Probe Attainable Flux-pinning in Coated Conductors</u>²⁷, Office of Naval Research (ONR) award. \$ 886,700.00, 2021-2024. PI: A. Goyal. • <u>UB RENEW and NY Department of Energy Conservation (DEC) Partnership</u>²⁸ : Comprised of two sub-projects on Plastics Recycling and Education/Outreach totaling \$ 1,910,892.00, 2019-2021. Project Director / PI: A. Goyal. • <u>Assessing the state of waste tire markets, and then evaluating potential policy options to improve tire recycling</u>²⁹ , Environmental Protection Fund as administered by the New York State Department of Environmental Conservation. \$ 250,000.00, 2021-2022. Project Director / PI: A. Goyal.

²⁷ <https://engineering.buffalo.edu/home/news/seas.host.html/content/shared/engineering/home/articles/news-articles/2021/goyal-receives-dod-grant-to-develop-high-performance-superconduc.detail.html>

²⁸ <http://www.buffalo.edu/renew/news-and-events/latest-news.host.html/content/shared/university/news/news-center-releases/2020/09/011.detail.html>

²⁹ <http://www.buffalo.edu/renew/news-and-events/latest-news.host.html/content/shared/university/news/news-center-releases/2021/01/024.detail.html>

- **Enhanced 2G HTS wire for Electric Motor Applications** with American Superconductor Corporation (AMSC) under DOE-EERE Program on Next Generation Electric Machines: Enabling Technologies (DE-FOA-0001467), University at Buffalo component, \$ 594,579.00, 2017 – 2020, PI: A. Goyal.
- **NY SUNY 2020 V Expanded Investment and Performance fund – EIP Category**. \$ 1,300,000.00, 2016 - 2020; A. Goyal (Project Director / Lead Applicant, UB-RENEW).
- **Developing the City of Buffalo's Energy Plan**: 2015 – 2020, \$ 673,417.00, Project Director / PI: A. Goyal.
- **UB RENEW and BSA Partnership**: 2015 – 2022, \$ 1,300,000.00.

External Funds as co-I at UB (\$2.5M):

- **Delamination as Key Enabler for the Recycling of Polymer-based Multilayer Packaging**, REMADE Institute under DE-EE0007897 – U.S. DOE Advanced Manufacturing Office, \$ 555,600.00, co-PI.
- **Valorization of Plastic Waste via Advanced Separation and Processing**, NSF EFRI E3P, \$ 1,999,998.00, 2021-2024, co-I.

Past grant funding prior to joining UB in 2015 (~ \$40M):

- **Single-Crystal and Single-Crystal-Like Graphene in Large-Areas for Electric and Electronic Applications**: Laboratory Directed Research and Development (LDRD) project, 2012 – 2015, \$ 1,000,000.00, PI: A. Goyal.
- **Roll-to-Roll Large-Scale Graphene Production by Graphene**: Technology Innovation Project (TIP), 2013-2015, \$ 200,000.00, PI: A. Goyal.
- **Thin-Film Si Photovoltaics: Funds-in CRADA with Ampulse Corporation**: 2011-2014, \$ 1,600,000.00, PI: A. Goyal.
- **Towards High-Performance, Earth-Abundant, Thin-Film Cu₂O-based Solar Cells**: LDRD funded SEED Project, 2011-2012, \$ 200,000.00.
- **MgB₂-Ga Composite Conductors**: Funds-in Work-for-Others (WFO) project with Gridlogic Inc.: 2012-2013, \$ 100,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire**: Office of Electricity Delivery and Energy Reliability, 2011-2012, \$ 300,000.00.
- **Strategic Substrate Development for Coated Conductors**: Office of Electricity Delivery and Energy Reliability, 2010, \$ 450,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire**: Office of Electricity Delivery and Energy Reliability, 2010, \$ 800,000.00.
- **ORNL-SuperPower CRADA: Development of MOCVD-based, IBAD- 2G Wires**: Office of Electricity Delivery and Energy Reliability, 2010, \$ 800,000.00.
- **Engineered Defects for Coated Conductors**: Office of Electricity Delivery and Energy Reliability, 2010, \$ 400,000.00.
- **Compact Transformers for Secure High-Power Density Applications**: LDRD project, 2008-2010, \$ 700,000.00.
- **Strategic Substrate Development for Coated Conductors**: Office of Electricity Delivery and Energy Reliability, 2009, \$ 425,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire**: Office of Electricity Delivery and Energy Reliability, 2009, \$ 800,000.00.
- **MOCVD-based IBAD 2G Wire – SuperPower CRADA**: Office of Electricity Delivery and Energy Reliability, 2009, \$ 800,000.00.
- **Engineered Defects for Coated Conductors**: Office of Electricity Delivery and Energy Reliability, 2009, \$ 425,000.00.

- **Fundamental Mechanisms of Self-Assembly of Ordered Nanostructures in Heterogeneous Ceramic Materials:** LDRD project, 2007-2009, \$ 700,000.00.
- **Strategic Substrate Development for Coated Conductors:** Office of Electricity Delivery and Energy Reliability, 2008, \$ 425,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire:** Office of Electricity Delivery and Energy Reliability, 2008, \$ 800,000.00.
- **ORNL-SuperPower CRADA: Development of MOCVD-based, IBAD- 2G Wires:** Office of Electricity Delivery and Energy Reliability, 2008, \$ 800,000.00.
- **Engineered Columnar Defects for Coated Conductors:** Office of Electricity Delivery and Energy Reliability, 2008, \$ 425,000.00.
- **CRADA with Directed Vapor Technologies:** Office of Electricity Delivery and Energy Reliability, 2008, \$ 35,000.00.
- **Funds-in WFO with NanoSolar Inc.:** Funds-in, 2008, \$ 30,000.00.
- **MetOx Technologies CRADA:** Office of Electricity Delivery and Energy Reliability, 2006-2008, \$ 795,000.00.
- **Nanocomposite Dielectrics: New Smart Materials for Electric Power Applications and Smart Grid:** LDRD project, 2005-2007, \$ 700,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire:** Office of Electricity Delivery and Energy Reliability, 2007, \$ 850,000.00.
- **ORNL-SuperPower CRADA: Development of MOCVD-based, IBAD- 2G Wires:** Office of Electricity Delivery and Energy Reliability, 2007, \$ 800,000.00.
- **Strategic Substrate Development for Coated Conductors:** Office of Electricity Delivery and Energy Reliability, 2007, \$ 500,000.00.
- **Engineered Columnar Defects for Coated Conductors:** Office of Electricity Delivery and Energy Reliability, 2007, \$ 350,000.00.
- **High-Performance, Low-Cost Photovoltaic Cells:** Battelle Memorial Institute, 2005-2006, \$ 130,000.00.
- **A Novel Thermomechanical Process for Producing Fe-3%Si Magnetic Steel Sheet for Transformers:** LDRD project, 2004-2006, \$ 700,000.00.
- **Large-Area, Flexible, Heteroepitaxial, Single-Crystal-like Diamond Films on Low-Cost Substrates for Wide-Ranging Electronic Applications:** SEED project, 2005-2007, \$190,000.00.
- **ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire:** Office of Electricity Delivery and Energy Reliability, 2006, \$ 800,000.00.
- **ORNL/AMSC FUNDS-IN CRADA: Development of RABiTS Based 2G Wire:** Office of Electricity Delivery and Energy Reliability, 2006, \$ 180,000.00.
- **Epitaxial Coatings for Coated Conductors:** Office of Electricity Delivery and Energy Reliability, 2006, \$ 850,000.00.
- **ORNL-SuperPower CRADA: Development of IBAD-based 2G Wires:** Office of Electricity Delivery and Energy Reliability, 2006, \$ 800,000.00.
- **ORNL – American Superconductor Strategic Research:** Office of Electricity Delivery and Energy Reliability, 2005, \$ 800,000.00.
- **ORNL/AMSC FUNDS-IN CRADA: Development of RABiTS Based 2G Wire:** Office of Electricity Delivery and Energy Reliability, 2005, \$ 180,000.00.
- **RABiTS Substrates Research and Development:** Office of Electricity Delivery and Energy Reliability, 2005, \$ 1,000,000.00.
- **Coated Conductor Strategic Research:** Office of Electricity Delivery and Energy Reliability, 2005, \$ 800,000.00.
- **Growth of MgB₂ for Superconductor Applications:** SEED project, 2002-2004, \$30,000.00.

	<ul style="list-style-type: none"> • <u>RABiTS Template Research and Development:</u> Office of Electricity Delivery and Energy Reliability, 2004, \$ 900,000.00. • <u>ORNL – American Superconductor Strategic Research:</u> Office of Electricity Delivery and Energy Reliability, 2004, \$ 925,000.00. • <u>ORNL/AMSC FUNDS-IN CRADA: Development of RABiTS Based 2G Wire:</u> Office of Electricity Delivery and Energy Reliability, 2004, \$ 180,000.00. • <u>RABiTS-based Strategic Research:</u> Office of Electricity Delivery and Energy Reliability, 2004, \$ 900,000.00. • <u>ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire:</u> Office of Electricity Delivery and Energy Reliability, 2003, \$ 800,000.00. • <u>ORNL/AMSC FUNDS-IN CRADA: Development of RABiTS Based 2G Wire:</u> Office of Electricity Delivery and Energy Reliability, 2003, \$ 180,000.00. • <u>RABiTS-based Strategic Research:</u> Office of Electricity Delivery and Energy Reliability, 2003, \$ 700,000.00. • <u>ORNL/AMSC CRADA: Development of RABiTS Based 2G Wire:</u> Office of Electricity Delivery and Energy Reliability, 2002, \$ 800,000.00. • <u>ORNL/AMSC FUNDS-IN CRADA: Development of RABiTS Based 2G Wire:</u> Office of Electricity Delivery and Energy Reliability, 2002, \$ 180,000.00. • <u>Oxford Superconductors – ORNL CRADA:</u> Office of Electricity Delivery and Energy Reliability, 2000-2002, \$ 200,000.00. • <u>Microcoating Technologies – ORNL CRADA:</u> Office of Electricity Delivery and Energy Reliability, 2000-2002, \$ 200,000.00. • <u>3M – ORNL CRADA:</u> Office of Electricity Delivery and Energy Reliability, 1998-2002, \$ 2,000,000.00. • <u>Midwest Superconductivity:</u> Office of Electricity Delivery and Energy Reliability, 1995-1997, \$ 1,000,000.00. • <u>General Electric (GE) – ORNL CRADA:</u> Office of Electricity Delivery and Energy Reliability, 1992-1995, \$ 1,500,000.00. • <u>ORNL/AMSC CRADA: Development of BSCCO-based HTS wires:</u> EERE, 1991-1995, \$ 2,000,000.00. • <u>Strategic High-Temperature Superconductivity Research:</u> EERE, 1991-1995, \$ 1,500,000.00.
<div>Invited Publications</div>	<ol style="list-style-type: none"> 1. Invited Overview Chapter in Handbook of Superconducting Materials, titled “<i>HTS conductor processing techniques</i>”, 2017. 2. Invited Overview Chapter in second edition of handbook titled “<i>Nanotechnologies to enable high-performance superconductors for energy applications</i>”, published by Wiley-VCH, 2013, edited by J. Garcia, Spain. 3. Invited Book Chapter for book titled “<i>Interfaces in Electronic Materials</i>” published by Francis Dodds of Woodhead Publishing, 2011. 4. Invited Overview Chapter in handbook titled “<i>Nanotechnology for the Energy Challenge</i>”, published by Wiley-VCH, 2009, edited by J. Garcia, Spain. 5. Invited Overview Chapter in book titled “<i>Thin Film Metal-Oxides: Fundamentals and Applications in Electronics and Energy</i>” published by Springer, 2009, edited by S. Ramanathan, Harvard University. 6. Invited Overview Chapter in book titled “<i>CSD of Functional Oxide Thin Films</i>”, To be published by Wiley-VCH, 2009, edited by T. Schneller, R. Waser and D. Payne. 7. Invited Paper, titled “Multifunctional, phase-separated, BaTiO₃+CoFe₂O₄ cap buffer layers for improved flux-pinning in YBa₂Cu₃O_{7-δ} based coated conductors,” to be published in special issue of Superconductor Science & Technology, 2009.

8. **Invited Paper**, titled “Enhanced and Uniform in-Field Performance in Long (Gd,Y)-Ba-Cu-O Tapes with Zirconium Doping Fabricated by Metal Organic Chemical Vapor Deposition,” to be published in special issue of Superconductor Science & Technology, 2009.
9. **Invited Paper**, titled “Effects on J_c of Pining Center Morphology for Multiple-in-Line-Damage in Coated Conductor and Bulk, Melt-Textured HTS,” to be published in special issue of Physica C, 2009.
10. **Invited Paper**, titled “Magnetic field orientation dependence of flux pinning in (Gd,Y)Ba₂Cu₃O_{7-x} coated conductor with tilted lattice and nanostructures,” to be published in special issue of Physica C, 2009.
11. **Invited paper**, titled “Enhanced flux pinning in MOCVD-YBCO films through Zr-additions: Systematic feasibility studies,” to be published in special issue of Physica C, 2009.
12. **Invited Overview Chapter** in Encyclopedia of Materials: Science and Technology (EMSAT) on the RABiTS technology. 2007 Elsevier Ltd. All rights reserved. Editors: K. H. Jürgen Buschow, Robert W. Cahn, Merton C. Flemings, Bernard Ilshner (print), Edward J. Kramer, Subhash Mahajan, and Patrick Veyssière (updates), ISBN: 978-0-08-043152-9, pgs. 1-5.
13. **Invited Overview Chapter** in Book titled “Flux Pinning and AC loss Studies on YBCO Coated Conductors” edited by M. Parans Paranthaman and Venkat Selvamanickam, published by Nova Science Publishers.
14. **Invited paper**, published in the proceedings of the 1st International Congress on Ceramics, held in Toronto, Canada, June, 2006.
15. **Invited Overview Chapter** in Book titled “Second generation HTS Conductors” edited by A. Goyal, Published by Kluwer Academic Publishers, NY, October, 2005.
16. **Invited Overview Paper**, published in the Proc. Of the ISS’2004 in Physica C, 2005.
17. **Invited Overview Paper**, Published in the MRS Bulletin, August, 2004.
18. **Invited Overview Chapter** in Book “High Temperature Superconductivity I: Materials,” edited by A.V. Narlikar, pp. 377-398, 2004, published by Springer, NY.
19. **Invited Overview Chapter** in Book “Recent Research Developments in Applied Chemistry,” A new series in Applied Chemistry by Transworld Research Network, containing review articles, to be published 2004.
20. **Invited Overview Chapter** in Book on "Electron Backscatter Diffraction in Materials Science," pp. 319-337, 2000, Published by Kluwer Academic/ Plenum Publishers, New York, edited by A. J. Schwartz, M. Kumar and B. L. Adams.
21. **Invited Overview Paper**, published in the Proc. of ISS’2000, Tokyo, published by ISTE, Japan.
22. **Invited Overview Paper**, published in the Proc. of the IWCC’2000, Fukuoka, Japan, Oct. 2000.
23. **Invited Overview Paper**, J. of Minerals, Metals and Materials Special Issue on 21st Century Technologies, July 1999.
24. **Invited Overview Paper** for a special issue of the Journal MICRON titled “Advanced Microscopy Studies of High temperature Superconductors”, Vol. 30, No. 5, pgs. 463-478, Oct. 1999.
25. **Invited Overview Paper** titled “High Critical Current Density YBa₂Cu₃O₇ Tapes Using the RABiTS Approach”, J. of Superconductivity, 11, 481, 1998.
26. **Invited Overview Paper** for a Handbook of Superconducting Materials, Institute of Physics, 1999.
27. **Invited Overview Paper** on RABiTS in a special issue of Applied Superconductivity, titled, Long Length Conductor Development for Large-scale Applications”, paper titled “Epitaxial Superconductors on RABiTS: A Route

- Towards High Critical Current Density HTS Wire”, vol. 4, pg. 403-428, 1997.
28. **Invited Overview Paper** for a special issue of the Journal of Materials Research for the 10th Anniversary of HTS Materials, paper titled “Conductors with Controlled Grain Boundaries: An Approach to the Next Generation, High Temperature Superconducting Wire”, vol. 12, pg. 2924-2940, 1997.
 29. **Invited Plenary Lecture Overview Paper** for Proceedings of the 10th Frontiers in Electron Microscopy Conference, Chicago, Illinois. Published in Ultramicroscopy, 1997.
 30. **Invited Overview Chapter** on Texture Development in Book Titled “Preferred Orientation Development and Property Anisotropy from High Temperature Forming Operations Metals and Intermetallics”, 1997.
 31. **Invited Paper**, Proceedings of the 1998 US-Japan Workshop held in Okinawa, Japan, July 13-16, 1998.
 32. **Invited Paper**, Proceedings of the 1998 TMS Meeting, To be published in the J. of Superconductivity, 1998.
 33. **Invited Paper**, Proceedings of the 8th US-Japan Workshop, Dec. 7-10, Tallahassee, FL, 1997.
 34. **Invited Chapter** in Book titled “Synthesis and Properties of Advanced Materials”, with D. M. Kroeger, D. F. Lee and E. D. Specht, Kluwer Academic Publishers, pgs. 117-148, 1997.
 35. **Invited Paper**, EMSA’97 on Grain Boundary Studies of HTS materials, Proceedings of the EMSA meeting, 1997.
 36. **Invited Overview Paper** on Grain Boundaries in HTS Materials, Journal of Metals, Minerals and Materials, 1996.
 37. **Invited Research Paper**, Symposium on High Temperature Superconductors, 1996 Spring TMS Meeting, and Anaheim, CA.
 38. **Invited Research Paper**, Symposium on High Temperature Superconductors, 1995 Spring TMS Meeting (Feb 28th - Mar 3rd), Las Vegas, NV; Published in the J. of Electronic Materials, titled “Mesotexture and Microtexture in Bi-2223 Powder-in-tube Conductors”.
 39. **Invited Research Commentary**, J. of Minerals, Metals and Materials Special Issue on Superconductors, titled “Progress Towards Bulk applications of High-T_c Superconductors”, JOM, Aug. 1995.
 40. **Invited Research Paper**, Symposium on High Temperature Superconductors, 1994 Spring TMS Meeting (Feb 28th - Mar 3rd), San Francisco, CA; published in the J. of Electronic Materials, titled “Dependence of Critical Current Density on Microstructure and Processing of High-T_c Superconductors”.
 41. **Invited Research Commentary**, J. of Minerals, Metals and Materials Special Issue on Superconductors, titled “Advances in Processing of High-T_c Superconductors for Bulk Applications”, JOM, Dec. 1994.
 42. **Invited Review Article** with D. M. Kroeger, “Models for Long Range Current Flow in Bulk Oxide Superconductors”, J. of Minerals, Metals and Materials, Dec. 1994, pg. 14.
 43. **Invited Research Paper** with D. M. Kroeger, E. D. Specht, J. E. Tkaczky, J. Sutliff, J. A. Deluca, G. N. Riley, Jr., L. Masur, “Local Texture and Grain Boundary Misorientations in High-J_c Oxide Superconductors”, Published in J. of Superconductivity, Dec. 1994.
 44. **Invited Research Paper** with D. M. Kroeger, E. D. Specht, J. E. Tkaczky, J. Sutliff, J. A. Deluca, G. N. Riley, Jr., L. Masur, “Local Texture and Grain Boundary Misorientations in High-J_c Oxide Superconductors”, Published in J. of Superconductivity, Dec. 1994.
 45. **Invited Chapter** in Book titled "Interface and Grain Boundary Chemical Structures

	<p>in YBaCuO materials", with Z. L. Wang, R. Kontra, D. M. Kroeger and R. K. Williams, 1994.</p> <p>46. Invited Review Article - with Z. L. Wang, R. Kontra and D. M. Kroeger," Microstructures and Flux-pinning in Melt-processed 123", Materials Science Forum, 1993.</p> <p>47. Invited Review Article with D. M. Kroeger, "Critical Currents and Microstructure in Oxide Superconductors", J. of Minerals, Metals and Materials, Oct. 1992.</p>
Plenary and Invited Presentations	<ol style="list-style-type: none"> 1. <u>Invited Speaker</u>, 2022 Interagency (DoD, DoE, DoT, and NASA) Power Group Mechanical Working Group Meeting, on "Superconducting Material Research for Power Applications" June 9, 2022. 2. <u>Invited Speaker</u>, 2022 MRS Spring Meeting, held May 8-13, 2022 in Honolulu, Hawaii. 3. <u>Invited Speaker</u>, Kazuo Inamori School of Engineering, The New York State College of Ceramics, Alfred University, Dec. 2nd, 2021. 4. <u>Invited Keynote Lecture</u>, Applied Energy Symposium: MIT "A+B" (MITAB2020), May 17-19, 2020, at the Massachusetts Institute of Technology, Cambridge, USA. 5. <u>Invited Keynote Lecture</u>, 4th Overseas Academicians Qingdao Tour & Qingdao International Academicians Forum (QIAF), June 12th-15th, 2020, Qingdao, China. 6. <u>Invited Keynote Lecture</u>, 28th International Conference on Composites or Nano Engineering, ICCE-28 July 19-25, 2020 in Prague, Czech Republic. 7. <u>Invited Keynote Lecture</u>, 2nd International Conference on Green and Renewable Energy", September 14th-16th, 2020, Vancouver, Canada. 8. <u>Invited Distinguished Lecture</u>, College of Engineering and Computer Science, University of Central Florida, Orlando, January 24th, 2020. 9. <u>Invited Distinguished Lecture</u>, Applied Materials, Santa Clara, CA, October 18, 2019. 10. <u>Invited Speaker</u>, 22nd Joint Cryogenic Engineering Conference and International Cryogenic Materials Conference (CEC/ICMC), Hartford, CT, July 21st 25th, 2019. 11. <u>Invited Distinguished Lecture</u>, Applied Materials India, Whitefield, Bangalore, March 19th, 2019. 12. <u>Invited Distinguished Speaker</u>, Materials Research Center, Indian institute of Science, Bangalore, March 18th, 2019. 13. <u>Invited Speaker</u>, Workshop on Sensor Technology for Next Generation IoT, Sponsored by The Indo-US Science and Technology Forum (IUSSTF), Indian institute of Science, Bangalore, March 15th-16th, 2019. 14. <u>Invited Distinguished Mechanical Engineering Seminar</u>, University of Houston, Houston, TX, February 7th, 2019. 15. <u>Invited Distinguished Lecture</u>, Center for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bangalore, India, Dec. 20th, 2018. 16. <u>Invited Distinguished Lecture</u>, Chemistry Department, Indian Institute of Technology, Madras, Dec. 18th, 2018. 17. <u>Invited Plenary - 5th Institute Distinguished Lecture</u>, Indian Institute of Technology, Madras, Dec. 17th, 2018. 18. <u>Invited Plenary Keynote Speaker</u>, V Congress of Nanotechnology (CNN2018) held in Pucón, Chile, November 25th - 29th, 2018. 19. <u>Invited Speaker</u>, 2018 International Workshop on Materials Genomics (IWMG2018), Shanghai, October 6th-9th, 2018. 20. <u>Invited Speaker</u>, Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, Beijing, China, August 20th, 2018.

21. **Invited Keynote Speaker**, “Shanghai HTS conference”, Shanghai, China during August 15th-17th, 2018.
22. **Invited Speaker**, al-Farabi KazNU University, Kazakhstan, August 13th, 2018.
23. **Invited Keynote Speaker**, “6th International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS-2018),” August 8th-10th in Astana, Kazakhstan.
24. **Invited Speaker**, Center for Energy and Advanced Materials Science, National Laboratory Astana, Nazarbaev University, Kazakhstan, August 7th, 2018.
25. **Invited Plenary Keynote Speaker**, “International Conference on Nanosciences and Nanotechnologies,” Thessaloniki, Greece, July 3rd-6th, 2018.
26. **Invited Keynote Speaker**, “International Conference on Material Science and Engineering,” Rome, Italy during June 25th-27th, 2018.
27. **Invited Speaker**, 30th International Superconductivity Symposium (ISS 2016), Tokyo, Japan on December 13th-15th, 2017.
28. **Invited Speaker**, 2017 MRS Fall Meeting & Exhibition, Boston, MA, Nov. 26th – Dec. 1st, 2017.
29. **Invited Speaker**, Innovation Seminar Series, Waterloo Institute for Nanotechnology at the University of Waterloo on Nov. 21st, 2017.
30. **Invited Speaker**, Korea Research Institute of Chemical Technology, Daejeon, South Korea, August 22nd 2017.
31. **Invited Keynote Speaker**, International Workshop on Model Of Integrated Impact and Vulnerability Evaluation (MOTIVE) of Climate Change, 20-21 September 2017, Ocean Suites Jeju Hotel, Jeju-do, South Korea.
32. **Invited Speaker**, Korea Research Institute of Chemical Technology, Daejeon, South Korea, August 22nd 2017.
33. **Invited Speaker**, SuNAM, Gyeonggi, South Korea, August 19th, 2017.
34. **Invited Plenary Keynote Speaker**, 3rd Global Nanotechnology Congress and Expo, August 21-23, 2017, Dallas, USA.
35. **Invited Speaker**, Materials Science Department, Stanford University, August 3rd, 2017.
36. **Invited Speaker**, Department of Materials Science and Engineering Seminar, University of California at Davis, July 24th, 2017.
37. **Invited Speaker**, Thomas J. Watson School of Engineering & Applied Science, Binghamton University, June 28th, 2017.
38. **Invited Keynote Speaker**, EMN Meeting on Smart and Multifunctional Material, June 24-28, 2017 Rome, Italy.
39. **Invited Plenary Keynote Speaker**, 9th World Congress on Materials Science and Engineering, June 12-14, 2017 Rome, Italy.
40. **Invited Keynote Speaker**, 35th Greater Buffalo Environmental Conference, March 21st, 2017, Buffalo, NY.
41. **Invited Plenary Keynote Speaker**, International Conference on Advanced Materials, SCICON '16 held at Coimbatore, India, December 19-21, 2016.
42. **Invited Keynote Speaker**, Symposium on Materials for Energy and Environment Sustainability at Shibaura Institute of Technology, Tokyo, Japan on December on December 16th, 2016.
43. **Invited Speaker**, 29th International Superconductivity Symposium (ISS 2016), Tokyo, Japan on December 13-15, 2016.
44. **Invited Plenary Keynote Speaker**, Nanoenergy Nanosystem 2016 (NENS 2016) Beijing, China, from July 13-15, 2016.
45. **Invited Keynote Speaker**, Symposium on Electronic and Magnetic Materials at the 9

	<p>Pacific Rim International Conference on Advanced Materials and Processing (PRICM9) to be held in Kyoto, Japan, August 1 to 5, 2016.</p> <p>46. <u>Invited Keynote Speaker</u>, 6th Annual New Energy Forum - 2016 (NEF 2016), Kintex, S. Korea, from June 30th – Jul 3rd, 2016.</p> <p>47. Invited Speaker, 2016 EMN Qingdao Meeting, to be held from June 7-10, 2016 at Qingdao, China.</p> <p>48. Invited Speaker, 2016 MRS Spring Meeting, to be held in March 28-April 1, 2016 Phoenix, Arizona.</p> <p>49. Invited Speaker, 2016 Electronic Materials and Applications (EMA), Jan. 20-22, Orlando, Florida).</p> <p>50. Invited Speaker, 2015, The International Summit Forum on Materials Genome Initiative, China-MGI'2015, Shanghai, September 17-20, 2015.</p> <p>51. Invited Speaker, 2015, National University of Singapore (NUS), Singapore, July 23rd, 2015.</p> <p>52. <u>Invited Plenary Keynote Speaker</u>, Energy, Materials & Nanotechnology, http://www.emnsummer.org/2015/keynotes/, Cancun Meeting, Cancun, Mexico, June 8-11, 2015.</p> <p>53. Invited Speaker, 2015 10th Annual Energy Harvesting Workshop, to be held in Blacksburg, VA, September 13-15, 2015.</p> <p>54. Invited Speaker, 2015 TMS 144th Annual Meeting & Exhibition, to be held in Orlando, FL, March 15-19, 2015.</p> <p>55. Invited Speaker, 2015 MRS Spring Meeting, held in San Francisco, CA, April 6-10, 2015.</p> <p>56. Invited Speaker, 2015 Electronic Materials & Applications (EMA), held in Orlando, FL, January 21-23, 2015.</p> <p>57. Invited Speaker, 2014 MRS Fall Meeting, Graphene Symposium, held in Boston, MA, Nov. 30 – Dec. 4, 2014.</p> <p>58. Invited Speaker, 2014 MRS Fall Meeting, Roll-to-Roll Flexible Electronics Symposium, to held in Boston, MA, Nov. 30 – Dec. 4, 2014.</p> <p>59. Invited Speaker, College of Engineering, University of Wisconsin, Madison, WI, Oct. 28, 2014.</p> <p>60. <u>Invited Plenary Speaker</u>, BIT's 4th New Energy Forum to be held during September 21-23, in Qingdao, China, 2014.</p> <p>61. <u>Invited Speaker</u>, Materials Science & Engineering Seminar, Distinguished Speaker Series, North Carolina State University, February 7, 2014.</p> <p>62. <u>Invited Plenary Speaker</u>, FIN-2013, BIT's 1st Frontier Industrial Forum 2013, Qingdao, China, Oct. 24-26, 2013.</p> <p>63. <u>Invited Keynote Speaker</u> in a Theme Area of Conference, FIN-2013, BIT's 1st Frontier Industrial Forum 2013, Qingdao, China, Oct. 24-26, 2013.</p> <p>64. Invited Speaker, 2013, 16th US-Japan Workshop on Advanced Superconductors, held in Dayton, OH., July 9-12, 2013.</p> <p>65. Invited Speaker, 2013 Electronic Materials & Applications (EMA) Meeting, held in Orlando, FL, Jan 23-25, 2013.</p> <p>66. Invited Speaker, 2012 MRS Fall Meeting, held in Boston, MA, Nov. 25-29, 2012.</p> <p>67. Invited Speaker, DOE Headquarters, Inaugural lecture in a high-profile Science Lecture Series initiated by DOE Secretary Steven Chu.</p> <p>68. Invited Speaker, 2012 MRS Spring Meeting, held in San Francisco, CA, April 9-13, 2012.</p> <p>69. Invited Speaker, Nanofabrication Technologies for Roll-to-Roll Processing Workshop, an Academic-Industry Workshop on Technologies for American</p>
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	<p>Manufacturing Competitiveness, held Sept. 27-28, Boston, MA, 2011.</p> <p>70. Invited Speaker, 2011 MS&T Conference & Expo, Columbus, OH, Oct. 16-20, 2011.</p> <p>71. Invited Speaker, Corning Incorporated, Corporate Research Labs, Corning, NY, March 10, 2011</p> <p>72. <u>Invited Plenary Guest Speaker</u>, 2011Kshitij, The Techno-Management Festival at IIT, Kharagpur, India, held in Kharagpur, India, Jan. 28-31 (http://www.ktj.in/#home).</p> <p>73. Invited Speaker, 2010 MRS Fall Meeting, Held in Boston, MA, Nov. 29 – Dec. 3, 2010.</p> <p>74. Invited Speaker, 2010 International Workshop on Coated Conductors and Applications (CCA2010), held in Fukouka, Japan, Oct. 28-30, 2010.</p> <p>75. Invited Speaker, 2010 MS&T Conference & Expo, Houston, TX, Oct. 17-21, 2010.</p> <p>76. Invited Speaker, 2010 Applied Superconductivity Conference (ASC), held in Washington DC, Aug. 1-6, 2010.</p> <p>77. <u>Invited Keynote or Plenary Speaker</u>, Spring 2010 Meeting of the Ohio Section of the APS, April 30 – May 1, 2010, Flint, MI.</p> <p>78. Invited Speaker, 2010 MRS Spring Meeting, held in San Francisco, CA, April 5-9, 2010.</p> <p>79. Invited Speaker, 2010 International Workshop on Coated Conductors and Applications (CCA2010), held in Barcelona, Spain, Nov. 22-24, 2009.</p> <p>80. Invited Speaker, 2009 International Symposium on Superconductivity (ISS), Tsukuba, Japan, Nov. 2009.</p> <p>81. Invited Speaker, 2009 MS&T Conference & Expo, held in Pittsburgh, PA, Oct. 25-29, 2009.</p> <p>82. <u>Invited Institute Lecture</u>, Indian Institute of Technology, Kharagpur, India, August, 2009.</p> <p>83. Invited Speaker, Technical Society of Knoxville, August, 2009.</p> <p>84. Invited Speaker, College of Engineering, Oklahoma State University, June, 2009.</p> <p>85. Invited Speaker, 2009 MRS Spring Meeting, held in San Francisco, CA, April 13-17, 2009.</p> <p>86. Invited Speaker, 2008 Coated Conductor & Applications Workshop, held in Houston, TX, December 4-6, 2008.</p> <p>87. Invited Speaker, 2008 National NanoEngineering Conference, held in Boston, MA, November 12-13, 2008.</p> <p>88. Invited Speaker, 2008 Materials Science & Technology Conference, held in Pittsburgh, PA, October, 2008.</p> <p>89. Invited Speaker, 2008 Applied Superconductivity Conference, held in Chicago, Aug. 18-23, 2008.</p> <p>90. Invited Speaker, 15th International Conference on the Textures of Materials (ICOTOM), June 1-6, 2008.</p> <p>91. Invited Speaker, Materials Science & Engineering Department Seminar, University of Tennessee, Jan. 2008.</p> <p>92. Invited Speaker, 2008 MRS Spring Meeting held in San Francisco, CA, March 24-28, 2007.</p> <p>93. <u>Invited Keynote or Plenary Speaker</u>, 2007 Workshop on Advanced Materials for Energy Applications, held Barcelona, Spain, December 17-18, 2007.</p> <p>94. <u>Invited Keynote or Plenary Speaker</u>, 2007 International Workshops on Coated Conductors for Application (CCA2007) held at the Suites Hotel, Jeju island in Korea, November 8-10, 2007. Requested to represent the USA and talk about the</p>
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progress made in the US on coated conductors.

95. **Invited Speaker & Moderator**, 2007 National Nano Engineering Conference (NNEC2007), held in Boston, Nov. 14-15, 2007.
96. **Invited Plenary Speaker**, HK IAS-USA ICMR Workshop on Advanced Materials, Hong-Kong University of Science and Technology (HKUST), Hong-Kong, Sept. 12-15th, 2007.
97. **Invited Speaker**, Mechanical Engineering Department, Hing-Kong University of Science & Technology (HKUST), Hong-Kong, Sept, 2007.
98. **Invited Speaker**, 2007 Materials Science & Technology (MS&T 2007), Sept. 16-20, Detroit, MI, USA.
99. **Invited Speaker**, 2007 Joint Workshop on Integrated Electroceramic Functional Structures and Chemical Solution Deposition, held in Berchtesgaden, Germany, June 14-16th, 2007.
100. **Invited Speaker**, 2007 MRS Spring Meeting held in San Francisco, CA, April 9-13, 2007.
101. **Invited Speaker**, 2007 HTS Wire Development & Applications Workshop, Jan. 16-17, Panama City, Florida.
102. **Invited Speaker**, Siemens Corporate Technology, Bangalore, India, Dec. 8, 2006.
103. **Invited Speaker**, National Physical Laboratory, New Delhi, India, Dec. 1, 2006.
104. **Invited Speaker**, Indian Institute of Technology, New Delhi, India, Nov. 29, 2006.
105. **Invited Speaker**, Indian Institute of Science, Bangalore, India, Dec. 12, 2006.
106. **Invited Speaker**, Hybrid Electronic Devices, Bangalore, India, Dec. 13, 2006.
107. **Invited Speaker**, Indian Institute of Technology, Mumbai, Dec. 4, 2006.
108. **Invited Speaker**, Crompton-Greaves Corporate R&D, Mumbai, India, Dec. 18, 2006.
109. **Featured Invited or Plenary Speaker**, National Nano Engineering Conference, Nov. 9-10, Boston, MA.
110. **Special Invited Speaker**, International Symposium on Superconductivity (ISS2006), held in Nagoya, Oct. 30st -Nov. 1st, 2006.
111. **Key Invited Overview or Plenary Speaker**, International Workshop on Coated Conductors for Applications, CCA 2006, held at Schlosshotel Monrepos, Ludwigsburg, Germany, July 03 to 05, 2006.
112. **Invited Speaker**, 1st International Congress on Ceramics (ICC), Toronto, CA, June, 2006.
113. **Invited Speaker**, 2006 Beijing International Materials Week (2006 BIMW), June 25-30, 2006, China.
114. **Invited Speaker**, 14th Annual International Conference on Composites/NANO Engineering, ICCE-14, July 2-8, 2006, Broomfield, CO.
115. **Invited Speaker**, College of Engineering, University of New Brunswick, Canada, June, 2006.
116. **Invited Speaker**, International Workshop on Coated Conductors for Applications (CCA2005) to be held at La Posada Hotel, Santa Fe, NM USA, December 4-7, 2005.
117. **Invited Speaker**, 12th US-Japan workshop on High Performance Superconductors, Lake Lawn Resort in Lake Delavan, Wisconsin, October 10-12, 2005.
118. **Invited Plenary Speaker**, Swiss Workshop on Materials with Novel Electronic Properties, September 26 - 28, 2005, Les Diablerets Switzerland.
119. **Invited Speaker**, Korean Superconductivity Society Conference (KSC 2005), Pyung-Chang, South Korea, August 18-20, 2005.
120. **Invited Speaker**, Korean Institute of Machinery and Materials (KIMM), Changwon, August, 2005.

121. **Invited Speaker**, Korean Electrochemical Research Institute (KERI), Changwon, South Korea, August, 2005.
122. **Invited Speaker**, Symposium on Advanced Structural Materials at the Materials Research Symposium in Cancun, Mexico, August 2005.
123. **Invited Speaker**, Materials Research Symposium at the Department of Materials Science & Engineering, University of California, Santa Barbara, CA, April 28, 2005.
124. **Invited Speaker** at the Symposium titled 'Functional Ceramic Materials and Thin Films' to be held during the 2005 International Conference on Materials for Advanced Technologies (Singapore) scheduled for 3-8 July 2005.
125. **Invited Speaker**, 2005 MRS Spring Meeting, March 28-April 1, San Francisco, CA.
126. **Invited Speaker**, 107th Annual Meeting & Exposition of The American Ceramic Society, Baltimore, Maryland, April 10-13, 2005.
127. **Invited Speaker**, 6th Pacific Rim Conference on Ceramic Glass & Technology, September 11-16, 2005, Maui, Hawaii.
128. **Invited Speaker**, 2005 TMS Meeting and Exposition, Feb. 13-17, San Francisco, CA, 2005.
129. **Invited Speaker**, 12th Annual International Conference on Composites/NANO Engineering (ICCE-12), August 1-6, Tenerife, Canary Islands, Spain, 2005.
130. **Invited Speaker**, 17th International Symposium on Superconductivity 2004, ISS2004, Nov. 23-25, 2004, Tokyo, Japan.
131. **Invited Speaker**, Coated Conductor Workshop and Applications (CCA2004), Nov. 18-20, Kanagawa, Japan, 2004.
132. **Invited Speaker**, 2004 American Ceramic Society Annual Meeting, held in Indianapolis, IN, April 19-21, 2004.
133. **Invited Speaker**, ICMC Topical Conference of Superconductors on Materials, Processing and Critical Current of Superconductors, Feb. 10-13, 2004, Wollongong, NSW, Australia.
134. **Invited Speaker**, International Workshop "High Temperature Superconductors and Novel Inorganic Materials Engineering" (MSU-HTSC VII), held in Moscow, Russia, on June 20-25, 2004.
135. **Invited Speaker**, Eleventh Annual International Conference on Composites/NANO Engineering, ICCE-11, August 8-14, Hilton-Head Island, South Carolina, 2004.
136. **Invited Plenary Speaker**, International Coated Conductor Workshop, held in Orta, Italy, September 12-13, 2003. Requested to represent the USA and talk about the progress made in the US on coated conductors.
137. **Invited Speaker**, 12th International Workshop on Critical Currents (IWCC12), Tokyo, Japan, September 2003.
138. **Invited Speaker**, DOE Wire Workshop, Session on Substrates Development, St. Petersburg, FL, January, 2003.
139. **Invited Speaker**, DOE Wire Workshop, Session on YBCO, St. Petersburg, FL, January 2003.
140. **Invited Plenary Speaker**, Symposium on HTS superconductors at Thermec 2003, in Madrid, 7-11 July 2003.
141. **Invited Speaker**, Symposium on Recrystallization at Thermec 2003, in Madrid, 7-11 July 2003.
142. **Invited Speaker**, The 13th International Conference on Textures of Materials (ICOTOM 13), Aug. 26-30, Seoul, South Korea, 2002.
143. **Invited Speaker**, Korea Electrotechnology Research Institute, Changwon, Korea, Aug. 22, 2002.
144. **Invited Speaker**, Pohang University of Science & Technology, Department of

	<p>Physics, Pohang Superconductivity Center, Pohang, Korea, Aug. 23, 2002.</p> <p>145. Invited Speaker, Seoul National University, Seoul, Korea, Aug. 30, 2002.</p> <p>146. Invited Speaker, International Conference on Metallurgical Coatings and Thin Films, April 22-26, 2002.</p> <p>147. Invited Speaker, 10th International Ceramics Congress, CIMTEC, 2002, Italy, July 14-19, 2002.</p> <p>148. Invited Speaker, ASM Local Chapter, March 2002.</p> <p>149. Invited Plenary Speaker, Spring TMS Meeting, Seattle, WA, Feb. 2002.</p> <p>150. Invited Speaker, American Ceramic Society Meeting, April, 2002.</p> <p>151. Invited Speaker, Fall MRS Meeting, Boston, Nov. 2001.</p> <p>152. Invited Speaker, Physics Division Colloquia, ORNL, Sept. 2001.</p> <p>153. Invited Speaker/Lecturer, Short course on Control of Grain Boundary Networks in Polycrystalline Functional Materials and on High Temperature Superconductors, University of Talca, Chile, Dec. 11-21, 2000.</p> <p>154. Invited Speaker, University of Chile, Santiago, Chile, Dec. 26, 2000.</p> <p>155. Invited Speaker, International Workshop on Critical Currents and Applications of HTS," held in Fukuoka, Japan, Oct. 18-19, 2000.</p> <p>156. Invited Speaker, ISS2000, International Superconductivity Symposium 2000 held in Tokyo, Japan from Oct. 14-16.</p> <p>157. Invited Speaker, International Superconductivity Technology Center (ISTEC), Nagoya, Japan, Oct. 20, 2000.</p> <p>158. Invited Speaker, <i>Gordon Conference on Grain Boundaries in Ceramics</i>, held on Aug. 6-11, 2000, Meriden, NH.</p> <p>159. Invited Speaker, E-Source Conference, November 13-16, 2000, Colorado Springs, CO.</p> <p>160. Invited Speaker, Thermec'2000, Int. Conf. On Processing, Fabrication, Properties and Application, held at Las Vegas, Dec. 4-8, 2000.</p> <p>161. Invited Speaker, 2000 ASM Fall Meeting, Symposium on Texture Analysis for Process and Quality Control, Oct. 9-12, St. Louis, MO.</p> <p>162. Invited Speaker, 2000 TMS Fall Meeting, Symposium on Electron Backscatter Diffraction, Oct. 9-12, St. Louis, MO.</p> <p>163. Invited Speaker, 2000 Applied Superconductivity Conference, held in Virginia Beach, September 18-22, 2000.</p> <p>164. Invited Speaker, 2000 TMS Spring Meeting, Symposium on High Temperature Superconductors, Nashville, TN, March 12-15, 2000.</p> <p>165. Invited Speaker, 2000 DOE Wire Development Workshop, held at St. Petersburg, FL., February, 2000.</p> <p>166. Invited Speaker, Carnegie Mellon University, Materials Seminar Series, given on October 28, 1999.</p> <p>167. Invited Plenary Speaker, 9th International Workshop on Critical Currents, July 7-10, 1999, Madison, Wisconsin.</p> <p>168. Invited Speaker, 1999 American Ceramic Society Annual Meeting, held in Indianapolis, IN, April 25-28.</p> <p>169. Invited Speaker, 12th. International Conference on Textures of Materials (ICOTOM12), Montreal, August 9-13, 1999.</p> <p>170. Invited Speaker, 1999 DOE Wire Development Workshop, held at Cocoa Beach, FL 32931, January 12-13.</p> <p>171. Invited Speaker, 1999 Spring TMS Meeting, held in San Antonio, Texas, February 15-19, 1999.</p>
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172. **Invited Speaker**, 1999 Electron Microscopy Meeting (EMSA), to be held in August, 1999, Portland, OR.
173. **Invited Speaker**, 1999 Fall MRS Meeting, held in Boston. MA, Nov-Dec, 1999.
174. **Invited Speaker**, First Regional Conference on Magnetic and Superconducting Materials (MSM-99), 27-30 September, 1999, Tehran - Iran.
175. **Invited Speaker**, 1998 International Workshop on Superconductivity, held in Okinawa, Japan, July 12-15, 1998.
176. **Invited Speaker**, 1998 Innovations in Materials Research Conference (IMC), held in Washington, DC, July 20-22, 1998.
177. **Invited Speaker**, 1998 DOE Workshop on Coated Conductors, held in Washington, DC, July 22-24, 1998.
178. **Invited Speaker**, 1998 MISCON Meeting, held in Columbia, MO, July 27-31, 1998.
179. **Invited Speaker**, Fifth International Workshop on High Superconductors, held March 24-29, Moscow, Russia, 1998.
180. **Invited Speaker**, Processing and Critical Currents of High Temperature Superconductors, February 2-4, 1998 in Wagga, NSW, Australia.
181. **Invited Speaker**, 1998 Spring TMS Meeting, held in San Antonio, Texas, February 15-19.
182. **Invited Speaker**, 1998 Electron Microscopy Meeting (EMSA), held in July'98, Atlanta, GA.
183. **Invited Speaker**, 8th US-Japan Workshop on High Temperature Superconductors, December 8-10, 1997, National Magnet High Field Laboratory (NHMFL) in Tallahassee, Fl.
184. **Invited Speaker**, Harvard University, Materials Science Center, Monday, Sept. 8, 1997.
185. **Invited Plenary Speaker** on Grain Boundary Studies of HTS Materials Using Electron Backscatter Kikuchi Diffraction, Frontiers in Electron Microscopy in Materials Science, June 4-7, Oak Brook, Illinois.
186. **Invited Speaker**, 1997 Spring MRS Meeting, held in San Francisco, CA, March 31 - April 4, 1997.
187. **Invited Speaker**, 1997 Spring TMS Meeting, held in Orlando, Florida, Feb. 1997.
188. **Invited Speaker**, 1997 Electron Microscopy Meeting (EMSA), held in August'97, Cincinnati, Ohio.
189. **Invited Speaker**, 1997 American Crystallographic Society Meeting, held in July, St. Louis, MO, 1997.
190. **Invited Speaker**, Wright-Patterson Air Force Base, Ohio, April, 1997.
191. **Invited Speaker**, University of Kansas, August, 1997.
192. **Invited Speaker**, 1997 US-DOE HTS Wire Development Workshop, February 6-7, Panama City, Florida.
193. **Invited Speaker**, 1996 Spring Technical Materials Society (TMS) Meeting, February 4-8, 1996 at Anaheim, CA, talk titled "Fabrication of Biaxially Aligned Polycrystalline HTSC Conductors", A. Goyal et al.
194. **Invited Speaker**, Rex'96, International Conference on Recrystallization and Related Topics", held in Monterrey, CA, Oct. 21-24, 1996.
195. **Invited Speaker**, Material Science Seminar on "Grain Boundary Networks and Percolation in HTS Materials", Dept. of Materials Science, University of Wisconsin, Sept. 12, 1996.
196. **Invited Speaker** on "RABiTS: A New Approach to High-Jc Conductors", Applied Superconductivity Center, University of Wisconsin, Sept. 13, 1996.
197. **Invited Speaker**, Sumitomo Electric Company, Osaka, Japan, on "RABiTS

	Technology and Percolation in HTS Materials” Oct. 25, 1996.
	198. Invited Speaker , Fujikura Ltd., Tokyo, Japan, on “RABiTS Technology and Percolation in HTS Materials” Oct. 28, 1996.
	199. Invited Speaker , Hitachi, Ibaraki, Japan, on “RABiTS Technology and Percolation in HTS Materials” Oct. 29, 1996.
	200. Invited Speaker , National Research Institute for Metals, Tsukuba, Japan, on “RABiTS Technology and Percolation in HTS Materials” Oct. 25, 1996.
	201. Invited Speaker , Nippon Steel Corporation, Tokyo, Japan, on “RABiTS Technology and Percolation in HTS Materials” Oct. 29, 1996.
	202. Invited Speaker , ISTE, Ibaraki, Japan, on “RABiTS Technology and Percolation in HTS Materials” Oct. 29, 1996.
	203. Invited Speaker , Seventh US-Japan Workshop on High- T_c Superconductors, 1995, October 23-27, Tsukuba, Japan, talk titled “Fabrication of Biaxially Textured Using the RABiTS Process”, A. Goyal et al.
	204. Invited Speaker , 1995 Fall Materials Research Society (MRS) Meeting, To be held in Nov, 1995 at San Francisco, CA, talk titled “Fabrication of Biaxially Aligned Polycrystalline HTSC using a New Process”, A. Goyal et al.
	205. Invited Speaker , 1995 Pacific Coast Regional Meeting (PCRM) of the American Ceramic Society, Nov 1-3, 1995 at Seattle, WA, talk titled “Microstructure and Superconducting Properties across Oriented Domains in Textured Bulk YBCO”, D. F. Lee, A. Goyal and D. M. Kroeger.
	206. Invited Speaker , 1995 International Cryogenic Materials Conference (ICMC), July, 1995, Cleveland, Ohio, talk titled “Biaxially Textured Superconductors Fabricated using a Non-IBAD Process”, A. Goyal et al.
	207. Invited Speaker , 1995 International Workshop on Superconductivity co-sponsored by ISTE and MRS, June 18-21, Maui, USA, talk titled “Effect of Colony Microstructure on the Transport Critical Current of High- J_c Tl-1223 Thick Films”, A. Goyal et al.
	208. Invited Speaker , 1995 Spring Materials Research Society (MRS) Meeting, April, 1995, San Francisco, CA, talk titled “Texture and Grain Boundary Misorientation Distributions in Polycrystalline HTSC”, A. Goyal et al.
	209. Invited Speaker , 1995 Workshop on Processing of Thallium Oxide High Temperature Superconductors, Breckenridge, Colorado.
	210. Invited Speaker , 1995 Spring Technical Materials Society (TMS) Meeting, February, 1995 at Las Vegas, Nevada, talk titled “Microtexture and Mesotexture in Bi-2223 Powder-in-tube Materials”, A. Goyal et al.
	211. Invited Speaker , 1995 US-DOE HTS Wire Development Workshop, February, St. Petersburg, FL, talk titled “Formation of Colonies of Aligned Grains During Thallination of Tl-1223 Thick Films”, A. Goyal et al.
	212. Invited Speaker , 1994 Pacific Coast Regional Meeting (PCRM) of the American Ceramic Society, Los Angeles, CA, Oct. 19-22, 1994, talk titled “Grain Boundary Misorientations and Critical Current Density in Tl-1223 Thick Films”, A. Goyal et al.
	213. Invited Speaker , 1994 Midwest Superconductivity Consortium's Workshop on Superconductivity, Aug. 11-12, 1994 at Purdue University, IN, talk titled “Effect of Grain Boundaries on Critical Current Density in HTSC Materials”, A. Goyal et al.
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