CURRICULUM VITAE

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PROFESSIONAL PROFILE

Education

1977	Purdue University, Ph.D. (M.E.)
1974	Purdue University, M.S.M.E.
1972	Purdue University, B.S.M.E, with Highest Distinction

Professional Positions

2021 – present	Executive Director, International Advancement, Purdue University
2014 – 2020	Chief Corporate and Global Partnerships Officer, Purdue University
2015 – 2016	Senior Intellectual Property Officer, Purdue University
2014 – 2020	Senior International Officer, Purdue University
2014 – present	Professor of Mechanical Engineering, Purdue University
2010 – 2014	Professor and Dean, School of Engineering, University of California, Merced
2013 - 2014	Faculty Director (PI), Blum Center for Developing Economies, UC Merced
2009 - 2014	Member/Chair, Adv. Board, and Director, Engineers for a Sustainable World
2008 - 2011	Guest Professor, Mechanical Engineering Dept., Shanghai Jiao Tong University
2010 - 2013	Director, Center for IT Research in the Interest of Society, UC Merced node
2007 - 2010	Founding Director, GlobalHUB.org, NSF Engineering Virtual Organization
2005 - 2008	Founding Director, Global Engineering Program, Purdue University
2001 - 2010	William E. and Florence E. Perry Head, Mechanical Engineering, Purdue Univ.
1999 - 2010	Professor of Electrical and Computer Engineering, by courtesy, Purdue Univ.
1999 - 2001	Professor and Head, School of Mechanical Engineering, Purdue University
1995 - 1999	Associate Dean for Research, College of Engineering, Arizona State University
1995	Acting Chair, Mechanical and Aerospace Engineering Dept., Arizona State Univ.
1993	Alexander von Humboldt Fellow, Universität Karlsruhe, Germany.
1992	Visiting Professor, Chemical Engineering, Tech. Univ. Delft, The Netherlands.
1989 - 1992	Vice-chair (Aerospace), Mech. & Aerospace Engineering, Arizona State Univ.
1977 - 1999	Assistant, Associate, & Full Professor, Mech. & Aerospace Engineering, Arizona State
1973 - 1977	Teaching and Research Assistant, Mechanical Engineering, Purdue University.
1974 - 1975	Visiting Researcher, Technical University of Denmark, Lyngby
1970 - 1977	Engineering positions, Hughes Aircraft, Boeing, and Atlantic Richfield Research

Professional Interests

Laser/optical sensors for: rapid, label-free detection of biohazards including chem/bio agents and food-borne pathogens; cybersecurity education and research, surface defect and microfeature characterization; semiconductor manufacturing; combustion, and reacting flows. Global engineering education, cross-cultural communication, global teams, and assessment. Public-private Partnerships.

Honors, Citations, and Awards

- Outstanding Mechanical Engineer Award, 2010, from the School of Mech. Engineering, Purdue Univ., *for exemplary accomplishments and leadership in industry, academia, and governmental service.*
- Charles Russ Richards Memorial Award, 2009, awarded jointly by Pi Tau Sigma (honor society) and Amer. Soc. of Mech. Engineers (ASME), presented annually to *the engineering graduate who has demonstrated outstanding achievement in mech. engineering 20 years or more following graduation*.
- Delegate, 2009 U.S. - Islamic World Forum, Doha, Qatar.
- Hon. George E. Brown, Jr. Award for Intl. Scientific Cooperation, 2008, from the U.S. Civilian Research & Development Foundation (CRDF), Washington D.C. As the first engineer to receive Award, cited *in recognition of his outstanding commitment to international education and cooperative research*. Subsequent awardees include Craig Barrett, Rita Colwell, and Sen. Richard Lugar.
- Wings for Success Award, 2008, from the Minority Engineering Program, Purdue University, to the School of Mechanical Engineering for success in *graduating a diverse population of students*.
- Fellow, Amer. Soc. of Mech. Eng. (ASME), 2007, cited for *Research & Development* and *Education*.
- Achievement Award, 2006, from the International Network for Engineering Education and Research (iNEER). Cited for *development of programs for education of global engineers through comprehensive international experiences with international design team collaborations*.
- Team Excellence Award, 2004, College of Engineering, Purdue, for Global Engineering Alliance for Research and Education, with faculty from Languages & Cultures and Engineering.
- Alexander von Humboldt Fellow, 1993, from the Alexander von Humboldt Stiftung/Foundation.
- Governor's Recognition Award, 1993, by State of Arizona, for Center for Solid State Electronics.
- Finalist, White House Fellowship, 1987, President's Comm. on White House Fellows, Wash. D.C.
- Professor of the Year, 1982, Teaching Award by ASU ME Student Honor Society Pi Tau Sigma.
- College of Engineering Award for Significant Accomplishment in Research, 1980, Arizona State.
- National Science Foundation Grad. Fellow, 1973-1977; Howard Hughes Doctoral Fellow, 1974-76.
- Rhodes Scholar Nominee, 1972, Purdue University.
- Lubrizol Foundation, Delta Tau Delta, and C. W. Davidson Scholarships, Purdue, 1970-1972.
- Dean's Honor List all semesters, 1969-1977, Purdue University. B.S.M.E. degree in three years with Highest Distinction, 4.00 GPA, May, 1972.

LEADERSHIP AND TEAM IMPACT

Purdue University

Executive Director, International Advancement **2020-present**

Serving as the inaugural assignee to this Executive Directorship. The position strives to tightly links the Purdue Research Foundation (PRF), where the Advancement arm of Purdue resides, with the academic and faculty activity. The mission of this position is to advance Purdue's global posture, through international partnerships as well as from expanded engagement with Purdue's roughly thirty thousand international alums and friends. It involves supporting the Schools and Colleges in their global engagements, as well as working with alums and organizations that plug into Purdue at the institutional level. Facilitating development of a strategic plan to fortify alignment of the PRF and Purdue University missions is part of the charge. An important facet of that is to integrate a range of outreach activities including development and alumni relations, major gifts, regional alumni organizations, undergraduate recruiting, and engagement of parents. International gifts in 2020 were over $10M, a significant increase over previous years. The appointment is half time, with the remainder dedicated to Teaching, Research and Service on the faculty of Mechanical Engineering.

Chief Corporate and Global Partnerships Officer **2014-2020**

Founded and served as the inaugural leader of the Office of Corporate and Global Partnerships. Our overarching commission is to be the gateway for current and future partners to efficiently engage with

the large array of resources of the University. The mission of the Office is to *increase the impact, scale, and sustainability of corporate and global partnerships.* One innovative aim is to intentionally leverage the synergy between the corporate and global domains.

Primary responsibilities of corporate portfolio

- Leading development of strategic partnerships, and serving as primary executive-level contact;
- Overseeing data analytics and metrics for current and aspirational strategic corporate relationships;
- Overseeing the Technical Assistance Program;
- Serving on the 4-member Contract Review Board.

Primary responsibilities of global portfolio

- Building strategic alliances with international higher education institutions, NGOs, & corporations;
- Supporting activity with the two designated strategic partner *nations*, Colombia and India;
- Expanding international opportunities, both academic and professional, for students and faculty;
- Improving on-campus cross-cultural experience for both international and domestic students;
- Chairing the Global Academic Committee (associate deans of the Colleges);
- Overseeing the Global Policy Research Institute (2014-16).

Primary responsibilities as Senior Intellectual Property (IP) Officer

- Directing IP disclosures to the appropriate campus unit or external organization;
- Directing disclosure of Research Properties & Data, and assignment of Purdue IP to third parties;
- Working with the regional Campus IP officers as needed;
- Answering inquiries and making presentations on IP Policies and Procedures to faculty system-wide.

Primary responsibilities as Senior International Officer

- Overseeing International Programs, student & scholar services, study abroad, recruitment, admission;
- Reporting for Purdue Data Digest and Open Doors® report by the Institute of International Education;
- Adjudicating recommendations from the *Security and Risk Assessment Committee* on academic travel;
- Maintaining processes and executing agreements with international universities & organizations.

Impact - Strategic Corporate Partnerships

- Articulated the concept that partnerships, while always important to academia, have become truly mission-critical at this juncture. Presented this in the context of federal funding for research likely being flat at best and of Purdue holding tuition constant from 2012 through 2018-19, all with increasing demands for delivering on the evolving land-grant mission.
- Assembled and leading a virtual organization comprised of the university's key corporate-facing offices and staff, for synchronizing across campus to become an organized and consistent partner of choice.
- Developed and presented "Working with Industry" orientation workshops for faculty.
- Identified lack of access to accurate and timely information on all aspects of corporate partner engagement as a significant impediment to developing and growing strategic partnerships. Established that root causes include absence of unique corporate identifiers and lack of standard corporate hierarchies in the dozen or so independent legacy databases across campus.
- Developed Purdue Partners Platform (PPP), a partnership analytics tool for decision support. PPP integrates information from the Offices of: Development; Corp. & Foundation Relations; Sponsored Projects; Technology Commercialization; Career Services; Professional Practice; Purdue Research Parks; and the Foundry (start-ups). Using PPP plus qualitative information to downselect from ≈500 corporate sponsors to focus on ≈25 strategic partners.
- Designed PPP for external partner access, to convert partnership analytics into a strategic advantage.
- Applied PPP in support of Lilly Endowment grant on Transforming Indiana into a Magnet for High-Technology Jobs.
- Set records for annual private-sector awards ($73.4M) from for-profit entities and total private-sector funding ($145.7M) in 2018-19. Supported broad array of corporate sponsors (≈500/yr).
- Set record for number of unique principle investigators (372) on private-sector projects, 2015-16.
- Managed creation or significant strengthening of strategic partnerships, select examples include:

    - Rolls-Royce: $33M/6yr University Technology Partnership; established new R&T facility as 1st partner in Aerospace District Research Park;
    - Dr. Reddy's Labs, Hyderabad, new Doctoral Fellows Program, ≈$2M/5yr;
    - General Electric, Record awards of $2.1M for 2015-16, includes Brilliant Factories initiative, $10M/5yr; GE Aviation, long-term agreement in process; and GE Healthcare collaboration;
    - Sumitomo Chemical Corp., Tokyo, Innovation Center, ≈$1M awards in first year of engagement;
    - Fiat-Chrysler Automotive, doubled original partnership to $2.3M in research project awards in 2015-16; and partnering in new World Class Manufacturing Academy;
    - Ford Motor Co., Purdue selected as a strategic Alliance Partner for research, beginning 2017.
    - Originated the Digital Crossroads concept, piloted with Cummins Engine, that enables a pool of qualified students to work year-round on campus employed by Purdue on corporate projects related to the digital economy including data science & machine learning. Digital Crossroads supplies both work products and substantive connections to a highly-prepared cadre of ruthlessly-sought-after students. The Crossroads model is unique in that it is much more scalable than traditional internships.
- Identified Intellectual Property (IP) as critical factor in growing corporate sponsorship and engagement.
- Co-developed and articulated flexible yet balanced IP policies, including agreements encompassing paid-up license fees of varying terms, from ownership to options.
- Supported, in conjunction with Purdue's innovation ecosystem, the faculty in all-time-high invention disclosures (360), US & international patent applications (671) and patents issued (209), all in 2018-19.
- Identified Confidential Information Assurance as critical to success in growing corporate engagement, and co-developed a roadmap to transform Purdue's processes and turn this into a strategic advantage.
- Organized Information Assurance team that met with key partners to understand the need. Co-developed a cost-effective enterprise-wide infrastructure to deliver a baseline level of assurance, and ran a successful pilot. Plan in place to roll out to departments and centers.
- Co-developed and presented sessions on Purdue's Information Assurance processes to faculty and industry advisory councils.
- Encouraged development and offering of regular (semester-basis) orientation required for all researchers on a facility-by-facility basis.
- Received, as the result of a long-term team effort, the DOD Defense Security Service (DSS) Award. Purdue became only the 2nd university to ever receive the Award, and one of only three recipients (from thousands of eligible facilities) of the Award in 2016.
- Set records for funding and impact of the Technical Assistance Program (TAP), including $13.8M/5yr Manufacturing Extension Partnership (MEP) award from the National Institute for Standards & Technology (NIST) that quadrupled the program size. Purdue team of 180 faculty, staff, and students served 1483 employers in Indiana, and 109 employers outside of Indiana.
- Set records in 2016 for MEP total economic impact ($222.4M) and of jobs created/retained (2,166) attributable to MEP assistance. Benefits and impact measures reported annually by clients directly to NIST.
- Co-created a model for Purdue role in an Applied Research Institute. Ensured that key aspects of that model were included in a recently-awarded $42M Lilly Endowment gift for establishment of such an Institute. The award engages Purdue and other universities in supporting southwest Indiana and the Crane Naval Surface Weapons Lab.

Impact - Global Purdue

- Sponsored awards ($8.2M) in 2018-19 from non-US for-profit corporations based in twenty nations, up 138% in 4 years.
- Set record for Purdue undergraduate student experiences abroad (2,483) in 2017-18, ranked 19th in US.
- Set record for the number (9,303) of international students enrolled, 2016-17, Purdue hosts the largest number of international STEM students in any US university, ranked 4th among publics in Fall 2019.
- Enhanced the portfolio of intentional cross-cultural experiences for campus internationalization, via: International Friendship Program; Boiler Out (multinational community volunteer service); Boiler Gold

Rush International (supplemental first-year orientation program), and Multinational Intercultural Xchange (MIX) to pair seasoned PU students with just-arrived internationals.

- Created within the Office a new Center for Intercultural Learning, Mentorship, Assessment, and Research, CILMAR, to support development of curricular and co-curricular intercultural learning, and leverage the intensity and scale of Purdue's programs to grow funded research and scholarship.
- Sharpened strategic focus on two primary partner nations, Colombia and India. Defined strategies and roadmaps for: Signature Initiatives; bilateral Academic Mobility; Institutional Partnerships; Corporate & NGO Partnerships; Alumni Relations; and Marketing & Media.
- Colombia team (includes 20 or so key faculty and staff):
  - Registered Purdue International Inc., with full time director of partnerships in Bogota;
  - *Mobility:* Attracted ≈25/yr top undergrads from Colombia for 6 months of research at Purdue;
  - *Signature Initiative* launched for Innovation Ecosystems in Higher Education, to develop institutional capacity by increasing the scope and interconnection of education, research, and corporate partnerships. Acquired Phase 1 project funding ($0.5M) from prime sponsor Sapiencia, the Higher Education Agency of Medellín, with Ruta N as program manager. Offered workshops for 18 of the 45 universities in Antioquia, with breakout sessions for over 400 faculty, staff, and administrators who designed and developed campus innovation projects to deploy in upcoming Phase 2. Planning is underway to cluster the Antioquian innovation projects into Networks of Excellence so Purdue's impact is scalable, and to translate the outreach to other states in Colombia;
  - *Signature Initiative* launched for Master Planning for Sustainable Development of the Orinoquía region, which represents nearly half of the nation's land area. This land was effectively inaccessible during the war, but post-conflict will be crucial for the livelihood of a large number of Colombians, including both government and resistance soldiers. In Phase 1, funded at ≈$1M/1.5yr, analytical tools to be used by businesses, government and social agencies to determine the feasibility of specific plans for agriculture, agribusiness, and tourism in the Orinoquía region.
- India team (includes 20 or so key faculty and staff):
  - Formed India Working Group (key staff) and India Faculty Interest Group to accelerate activity;
  - Established Purdue-India Executive Council of highly placed Purdue Alumni;
  - Established and offering the C.N.R Rao Purdue-India Lecture Series, targeting growth in research collaboration. 2016 Series was on Pharma Manufacturing, and 2017 on Cybersecurity;
  - *Mobility* – established Purdue as #1 US university for undergrads from India (>900),
  - *Partnerships and Mobility* – established strategic partnerships with IIT Madras and IIT Hyderabad. Developed PURE (Purdue Undergraduate Research Experience) program to offer summer research to undergraduate students from partner schools, 25 participants in 2015-16;
  - *Signature Initiative* launched on Biopharma Manufacturing, linking to Dr. Reddy's Laboratories (DRL) who sponsored the 2016 Rao Lecture. The first related activity is the Doctoral Fellows Program where DRL selects top talent (2/yr) from their Hyderabad campus workforce (≈1,000 scientists) and supports them for a Purdue Ph.D. The first two Fellows arrived in January, 2017;
  - *Signature Initiative* incubated for Cybersecurity. Collaborative domain based on strategic alignment of the two largest democracies in the world, both with very large IT industries, as per the US-India Cyber framework issued by the Whitehouse with State Department focus. In Feb, 2017 the Purdue team participated in a workshop at Prime Minister Modi's National Institute for Transforming India with attendees including: India's National Cybersecurity Coordinator; cyber leaders of three branches of Indian armed forces, plus director-level professionals from: Central Bank of India, CERT-IN; Data Security Council of India, Defense Research Dev. Org. (DRDO); National Critical Information Infrastructure Protection Centre; and the National Digital Payments Council of India.

Impact –Corporate and Global Partnership Synergy

- Concentrated on study abroad student exchanges at universities where Purdue has or could have strategic relationships on fundable research or outreach;
- Facilitated growth of international opportunities for students, focusing on domestic students as well as engaging companies to provide internship opportunities for international students in their home countries;

- Created 3-way alliances that include international academic partner(s) and a multinational corporation, targeting funded collaboration on grand challenge research and education initiatives.

University of California, Merced

Dean, School of Engineering 2010-2014

Provided leadership within the 10th and newest campus (est. 2005) of the University of California system. UCM is the 1st and only US research university established in the 21st century, and it leads UC campuses in the enrollment of first-generation students, underrepresented students, and students from financially-challenged backgrounds. The San Joaquin Valley is one of the most economically-deprived regions of the US, sits amidst a water-energy-food nexus of national significance, and its communities are built on strong families and strong cultural ties. Defined a distinctive and fitting School mission with innovation, sustainability, and engagement as signature areas.

Primary responsibilities

- Providing effective leadership and management of academic, fiscal, and administrative activities in an academic start-up scenario.
- Orchestrating curriculum and program development for 4 non-accredited undergrad degree programs.
- Identifying competitive niches for graduate and research programs, recruiting faculty who bring focus and growth to those, and necessarily limiting the scope of activities as compared to larger universities.
- Fortifying faculty morale, in midst of CA budget crisis, temporary space, evolving curricula, unseasoned academic policies and procedures, very few and young alums, and many new faculty.
- Changing dramatically the professional experience profile of BS graduates, where less than 10% had paid engineering internships upon graduation in 2010-11.

Impact - Academic Ecosystem

- Embraced a pivotal role in educating the future demographic of America, providing a University of California research-university experience to 62% Pell-eligible, 62% first-generation (neither parent has a college degree) students with a demographic mix of 42% Hispanic, 24% Asian, 17% White, 6% African-American, and 5% from other underrepresented groups (2013-14 stats).
- Led aggressive multidimensional effort to grow the School of Engineering in size, stature, and impact, as well as the entire University through proportional impact (engineering educates a representative cohort of about one-third of the UCM students) and interdisciplinary activities, resulting in:
  - Engineering graduate programs debut, in 2015 after only ten years in existence, ranked at No. 140 by *U.S. News & World Report* (out of more than 200 doctoral-granting universities); and
  - Engineering graduate programs were ranked No. 127 in 2017 by *U.S. News & World Report* (out of more than 200 doctoral-granting universities);
  - In 2016 UC Merced was ranked No. 5 for enabling social mobility by *Washington Monthly* (out of more than 270 national universities);
  - In 2017 UC Merced was ranked No. 8 among all national universities in outperforming graduation rate expectations by *U.S. News & World Report*;
  - In 2017 UC Merced ranked No. 47 among public institutions in alumni giving rates by *U.S. News & World Report*, despite the youth of its alumni, the vast majority of whom are in their 20s.
- Increased underrepresented students in engineering from 28% to 44% (an increase of 285 students, or 57%) from 2009-10 baseline.
- Grew 1st year UG applications by 57% and UG FTE by 42%; grew graduate students by 58%.
- Developed strategic plan, guiding faculty growth from 28 to proposed 80 by 2020, driven by UC Merced's unique interdisciplinary research foci and graduate programs.
- Hired twelve faculty in 2012-14 (43% growth), including the first two faculty in the Gallo Management Program, the 1st UCM Chancellor's Professor, and an AFOSR Young Investigator. Two (of 35) faculty received NSF CAREER awards in 2013-14.
- Chaired Project 2020 Subcommittee on Academic Space Planning, 2013-14. Provided academic space requirements to a novel Public-Private Partnership concept to deal with campus growth in the highly-

constrained fiscal environment of a new university with little private funding yet positioned in a legacy university system. Project 2020 offered one contract for campus build-out through 2020 (~$1.3B) to the most creative and viable proposal.
- Finalized new $88M building for Schools of Engineering and Science, grand opening July 1, 2014.

Impact - Teaching, Research and Outreach
- Served as Faculty Director and Principle Investigator, UC Merced Blum Center for Developing Economies. Mission involves research, scholarship, and outreach addressing developing-world characteristics of the San Joaquin Valley, in order to transform poverty into prosperity. Initial funding $400k from UC plus $100k endowed gift from Richard Blum after 1st Progress Review. Created seed grant program to encourage interdisciplinary engagement.
- Successfully oversaw preparation of ABET self-study and hosted accreditation visit in October, 2013, resulting in inaugural accreditation on first try for all three applicable degree programs (Environmental Engineering, Materials Science & Engineering, and Mechanical Engineering). Programs received full 6-year accreditation, with next Comprehensive Review scheduled for 2019-20.
- Strengthened Engineering Advisory Board (EAB), with a focus on UCM's distinctive advantages and responsibilities. Modified agenda and processes to use time most effectively. Partners have represented major engineering and agricultural firms from the San Joaquin Valley (Gallo, Grundfos, PG&E, Pelco-Schneider, SoCal Edison, CA Department of Water Resources, CA Energy Commission) as well as Silicon Valley organizations (NASA, Google, HP, venture/angel communities).

Impact - Innovation and Entrepreneurship
- Focused on creating an environment that fosters innovation. Integrated innovation mindset into curriculum by developing and teaching the Professional Seminar as well as an interdisciplinary senior Capstone Project. Created the *Innovation and Design Clinic (IDC)* where regional firms and non-profits provide projects and mentoring for students. Enlisted a patent attorney to mentor students, such that 8 teams from 2013 and 2014 offerings submitted provisional patent applications on their senior capstone projects to the USPTO before the end of the semester.
- Delivered graduating seniors the opportunity for an industry-inspired, industry-mentored capstone project, as partial offset for the 90% of students who would not have had industry experience.
- Founded and organized *Innovate to Grow* event, where interdisciplinary teams (ENGR, CSE, MGT) do elevator pitches, videos, posters, and presentations, Judges representing VC, angel, and industry communities distributed $35k prizes (May 2014 sponsors SoCal Edison, Wells Fargo, Chevron).
- Developed innovative solution to IP issues for capstone project course whereby students may choose to voluntarily assign IP to partners in advance, with the expectation that their innovation will more likely be commercialized and/or the engagement of the mentors will be more robust.
- Co-Director, NSF Pathways to Innovation Program, UC Merced site, member of inaugural cohort supported by NSF and NCIIA. Mission to integrate innovation and entrepreneurship throughout the curriculum. Planning for UCM Service Learning / EPICS and Social Entrepreneurship as the cornerstone class, Innovation and Design Clinic as the Capstone; two University Innovation Fellows appointed at UCM.

Purdue University

Head, School of Mechanical Engineering 1999-2010

Led transformation of one of the two founding Schools of Purdue University (est. 1869. Formulated the Land Grant mission for the 21st century, embedding interdisciplinary emphasis, technological advancement, global engagement, and global professional competency into the teaching, research and service missions.

Primary responsibilities
- Create a compelling modern offering, while staying true to foundational concepts, to grow the student body in quantity and quality, as well as attract more research sponsorship.

- Oversee curriculum and program development for approximately 1,900 students including 1st year.
- Develop strategic plan to guide faculty hiring, facilities upgrade and expansion, communications, performance evaluation, and budgetary decisions.
- Oversee nearly 150 faculty and staff and three facilities.
- Manage an all-funds annual operating budget of approx. $60M from appropriated funds, annual contract and grant revenue, indirect cost return, continuing education, licensing income, and gifts.

Impact - Academic Ecosystem

- Focused on creating an environment that fosters innovation. Raised an endowed gift to support the Thomas J. and Sandra H. Malott Innovation Award presented first in 2009 to the most innovative senior design project and, continuing to this day.
- Increased economic development and tech transfer activity, ≈10X increase to all-time highs (2007-08) in disclosures (46), patent applications (13), patents issued (5), and currently-active licenses/options (27); 70% of inventions involved students, 70% of the ME faculty were involved.
- Expanded School to 64 tenure-track faculty, 70 staff (3 for development and alumni relations), over 1,400 undergraduates (includes 1st year students), and over 500 graduate students.
- Recruited 24 new faculty in final 6 years, including 6 women, 3 underrepresented minorities, 5 NSF CAREER awardees, and 2 PECASE awardees.
- Created 5-year BS/MBA, 5-year BS/MS, and Direct-to-Ph.D. degree tracks.
- Tripled School fiscal activity to over $60M/yr; $21M tuition/fees, $26M sponsored research, and $17M gifts while the general fund appropriation to the School increased from $8M to $11M/yr.
- Created and implemented Engineer-in-Residence program; industry posts full-time engineers in ME.
- Increased student participation in credit-bearing international experiences, from 1 in 1999-00 to all-time high of 85 in 2009-10, with the latter representing about 30% of BSME graduating class.
- Doubled Ph.D. graduation rate from historic <20/yr through 1990's to >40/yr (42 in 2008).
- Doubled archival journal publications to approx. 250/yr, citations increased at a greater rate.
- Instituted ME School leadership team and directed development of strategic plan to guide faculty hiring, physical plant expansion, communications, performance evaluation, and budgetary decisions.
- Tripled research expenditures to $26M/yr consistent with strategic plan, through interdisciplinary research center/signature initiatives, with major ME participation in 2 NSF Eng. Research Centers and leadership of major DOE Center grant (4th largest in Purdue history).
- Enhanced fund raising, recruited staff of 3 for development in ME, raised >$160M, $142M comprising the ME share of $1.7B Campaign for Purdue during 2000-07; personal involvement plus responsibility for 25 gifts >$1M, increased School endowment from $30M to over $80M.
- Quadrupled the value of scholarships/fellowships distributed to ME students to ≈$1.75M per year for the 2008-09 academic year, raised $12M in student support in the Campaign for Purdue;
- Raised $28M to triple the number of endowed ME professorships from 6 to 18.
- Raised $17.5M private funds for the $34.5M Roger B. Gatewood Wing of ME, the first LEED-certified (green) building on Purdue campus, opened in summer 2011.
- Combined $11.75M private funds with $11.75M NIST grant for $23.5M Herrick Laboratories expansion, Purdue's 3rd LEED-certified building, includes Gerald D. Hines Sustainable Buildings Technology Lab.
- Started a chapter of the student organization Engineers for a Sustainable World (ESW), and served as faculty advisor. Hosted the annual meeting of ESW at Purdue in 2010.
- Launched inaugural Green Week at Purdue in 2009 with Thomas Friedman Lecture, ESW student involvement, speakers, and campus & community projects. This event is now in its 8th year.

Impact - Global Education Initiatives

- Highlighted lack of global engagement as a high-risk weakness for students entering the workforce after graduating from ME, given that only one student of the 1,000 or so 2nd-4th year students in ME studied abroad for credit in 1999-2000.

- Conducted a survey of the 350+ BSME graduates in the class of 2000 and identified three barriers to participation: *delayed graduation; additional cost*; and lack of *community*.
- Confirmed that a lack of MOUs / university partners was not a barrier (more than 200 in force).
- Conceived the GEARE program (Global Engineering Alliance for Research and Education), and built a team to develop the program with the following elements:
  - Orientation with intercultural communications, engineering cultures, safety, and security;
  - 12 academic credits (4 courses typ.) of language/culture;
  - 3-month US internship at a global partner company;
  - 3-month international internship with the same GEARE corporate partner;
  - One semester of study abroad with fully transferable engineering course credits; and
  - a two-semester global design team project (one semester at the home university and one semester abroad) with design teams that include co-located students from partner universities.
  - Pre- and post-experience Intercultural Development Inventory (IDI) assessment, plus reflection
- Created a strategic approach to university partners for student exchange and research, selecting one per billion people (world population was 6B in 1999), initially U. Karlsruhe, Shanghai Jiao Tong, IIT Bombay, Monterrey Tech, with aspirations to later add the National University of Rwanda, and Jordan University of Science & Technology.
- Designed the GEARE program to mitigate all three perceived barriers:
  - *Graduation time* – articulated junior year spring semester abroad with engineering courses in prerequisite order, resulting in no delay, and guaranteed offerings at strategic partner universities;
  - *Cost* – raised and offered grant funds to make participation in the GEARE program cost neutral to students, regardless of whether they studied and interned in Indiana or India;
  - *Community* – Built cohorts of typically 5 Purdue students at each location, and offered a reciprocal program with equal number of students from abroad, creating an international cohort of ten students who were engaged for 2 or more years.
- Built a network of GEARE sponsor companies (Cummins, Dow, Ford, GM, John Deere, Shell, Siemens, United Technologies). Raised about $2M from various sources to make program participation cost-neutral for undergraduates and faculty on sabbaticals.

Purdue University

Founding Director, Global Engineering Program 2005-07

Commissioned by the dean to translate and scale up the prior success in building (from ground up) a department-level global program into an initiative at the College of Engineering level. By 2005 nearly $2M had been raised to support the ME global program, including the signature GEARE program, and participation went from one student to a nationally-competitive level. This was to become an integral component of the Engineer 2020 Initiative at the College level.

Primary Responsibilities

- Developing faculty and admin champions within the 10 other Schools in the College of Engineering.
- Identifying unique constraints and barriers arising with the various Schools, and modify strategies and programs as needed for success.
- Translating the model of working with a very small number of strategic partners to the other Schools, and engaging them in existing strategic partnerships as appropriate, such as with Shanghai Jiao Tong U.

Impact – Global Purdue

- Developed and taught global design team capstone and global service learning experiences for Purdue students in Puerto Rico, Mexico, Germany, China, India, Rwanda, Kenya and Jordan.
- Defined and established Program and Office to achieve preeminence in educating for global professional competence and in global collaborations for research, education, and engagement.
- Raised external funds to triple the $100k/yr College investment.
- Supported development of new courses, e.g. pre-freshman *Creativity and Engineering* (Singapore), *Energy in Global Context* (Germany), *Introduction to Intercultural Teamwork*, (Germany, China).

- Expanded GEARE program to include Schools of AAE, CE, ECE, and IE.
- Facilitated doubling in 2 years of participation in credit-bearing global engineering experiences by College of Engineering students.
- Established College-wide Minor in *Global Engineering Studies*.
- Founding Director and PI, GlobalHUB.org, awarded an NSF Engineering Virtual Organization (EVO) grant, 1 of 14 funded in inaugural class in 2007. GlobalHUB.org established as the first cybercommunity of scholars, practitioners, and students to advance global engineering education. From inception in December, 2007 through July, 2012 GlobalHUB.org had 407,068 visitors from 164 nations with over 21.16M hits.
- Assembled major GlobalHUB.org resources include Engineering Cultures ® On-line 2.0, Engineers for a Sustainable World; and sites related to the NSF International Research and Education in Engineering (IREE) program Grantees Conferences and student reflections.

Purdue University, and University of California, Merced

Philanthropy and Development 1999-2014

Embraced the imperative for university leaders at all levels to engage their stakeholders in considering the university and its students, faculty, academic units, and programs, for their philanthropic support. Developed PIR model for success that includes: ***Passion***, for the opportunity or subject; assurance that the outcome of a gift will have substantial ***Impact***; and ***Relationship*** with a university decision-maker who instills trust and can make it happen.

Primary Responsibilities

- Raising funds for facilities, research, education, and outreach programs that represent the margin of excellence, going beyond baseline activities supported through university general funds.
- Building strong relationships with alums and friends of the university, and making opportunities known.
- Stewarding gift and endowment funds.

Impact – Development infrastructure and Stewardship Activities

- Created in 2001 the Mechanical Engineering Awards Convocation that links the next generation of alums (scholarship and fellowship recipients) with past alums and donors who are giving forward. Speakers include students plus private and corporate donor representatives. Faculty and staff awards are also presented. The event was offered for 16th time in 2016.
- Instituted in 2001 an Investiture Ceremony for endowed Professorships, involving: donors and their family and friend; the Professorship recipient and their family and friends; plus faculty and staff. The ceremony has been held about twenty times, most recently in 2016.
- Created in 2012 the Innovate to Grow Showcase that connects event and project sponsors with students from design teams and their families. It also draws a broader audience from the community (several hundred total attend). The 7th Innovate to Grow is scheduled for May 12, 2017.
- Offered annual Outstanding Mechanical Engineer Awards Banquet for ten highly-worthy alums.
- Instilled philanthropic spirit in the next generation via appropriate engagement of students in stewardship activities, plus mini-campaigns for graduating seniors.

Impact – Significant Gifts

(25 of $1M or greater, ~$170M total, lead development role unless otherwise stated)

- *William E. and Florence E. Perry Head of Mechanical Engineering*, Purdue University, $10.5M gift made for the purpose of endowing the position of Head of the school of Mechanical Engineering, among the top 10 gifts in history of Purdue at that time.
- *Roger B. Gatewood Wing of Mechanical Engineering,* Purdue University, major gift by Roger B. Gatewood to name the $33M Gatewood Wing, an addition to the Main Campus ME Building.
- *Robert V. Adams Professor of Mechanical Engineering*, Purdue University, $3M endowment, gift made by Dr. Adams.

- *Kenninger Professor of Renewable Energy and Power*, School of Mechanical Engineering, Purdue University, $2M endowment, gift funded jointly by Ruth L. Kenninger and the Jaquish & Kenninger Foundation, matching gift from the Lilly Endowment, Inc.
- *Donald A. and Nancy G. Roach Professor of Advanced Manufacturing*, School of Mechanical Engineering, Purdue University, $2M endowment, comprised of major gift by Donald and Nancy Roach, combined with a matching gift from the Lilly Endowment, Inc., Indianapolis, IN.
- *Perception-Based Engineering (PBE) Laboratory, Hybrid Powertrain Lab, Ford Motor Company Instructional Laboratory, GEARE*, Purdue University, $5M from Ford Motor Co., from total gifts of about $7M involving multiple units and Schools at Purdue.
- *James J. and Carol L. Shuttleworth Professor of Mechanical Engineering*, Purdue, major endowment gift by Carol L Shuttleworth in honor of Jim Shuttleworth.
- *R. Eugene and Susie E. Goodson Professor of Mechanical Engineering*, Purdue University, $1.5M endowment, gift by Gene and Susie Goodson.
- Dr. James and Diane Perrella Human Injury Research and Regenerative Technologies Lab, Purdue, $2.3M, gift by Jim and Diane Perrella.
- *The Milton B. and Betty Ruth Hollander Atrium*, Purdue University, major gift by Betty Hollander, founder of Omega Engineering. The gift was a surprise made in honor of Milton B. Hollander.
- *Michael and Elaine Thiele Conceptualization Laboratory*, Purdue, $1M, Michael & Elaine Thiele.
- *Gerald D. Hines Sustainable Buildings Technology Laboratory*, Lab located in The Ray W. Herrick Laboratories, Mechanical Engineering, Purdue University, $2M, gift by Dr. Gerald D. Hines.
- *The Robert L. and Catherine R. Orth Student Commons*, Gatewood Wing, Purdue University, $1M, gift made by the Orths.
- *Feddersen Lecture Hall*, Gatewood Wing, Purdue University, $2.5M, gift made by Dr. Donald and Catherine Feddersen. Don chaired the ME Advisory Council Campaign Committee.
- Thomas J. and Sandra Malott Endowment for International Opportunities, and the Thomas J. and Sandra Malott Endowment for Innovation, Purdue University, $1M, gifts by Tom & Sandy Malott.
- *Herrick Laboratories,* Mech. Engineering, Purdue University, $3.5M, gift by Roger B. Gatewood
- *The Larry L. and Mary A. McDonald Scholarship Endowment,* Mech. Engineering, Purdue, $1M, gift by Ms. McDonald, http://www.purdue.edu/uns/html3month/2006/061106HirlemanAward.html
- *Cummins Power Lab*, Herrick Laboratories, Mechanical Engineering, $1M, gift from Cummins Inc.
- Caterpillar Product Engineering and Realization Lab, Gatewood Wing, $1M, Caterpillar Foundation.
- *Cummins Professor of Mechanical Engineering*, Purdue, $1.5M endowment, Cummins Inc., match from the Goodwin Family.
- *The Grant Arrasmith Scholarship and Fellowship Fund*, $1M endowment, gift made by Grant Arrasmith. http://www.purdue.edu/uns/html3month/2006/061106HirlemanAward.html
- The Dr. and Mrs. Vikram *Lakireddy Innovation and Design Clinic Endowed Fund*, School of Engineering, University of California, Merced, $150k, gift made by Dr. and Mrs. Lakireddy.
- *Recruiting, Retention, and Service Learning*, School of Engineering, UC Merced, $600k, gifts made by PG&E as part of a previous $1M pledge, but installments had been suspended for two years until 2011.
- *Well-Fargo Water-Energy-Food Challenge,* for the *Innovation and Design Clinic*, School of Engineering, UC Merced, $75k, gift made by the Wells Fargo Clean Technology Innovation Program, A subsequent additional $25k gift from the regional office as an Accelerator Award for the team with the most commercially-promising innovation in *Innovate to Grow 2014.*
- *Innovation and Design Clinic,* UC Merced, $250k, 2014 gifts made by E&J Gallo Wineries, Children's Hospital (CHCC), Hilmar Inc., Duarte Nurseries, Scholle Packaging, plus Wells Fargo *Challenge*.
- *Innovate to Grow,* UC Merced, $90k, 2012 and 2013 gifts made by California Dept. of Water Resources, Chevron, E&J Gallo Winery, Gunderson Dettmer, Hilmar Cheese, Lakireddy Endowed Fund, PG&E, Southern California Edison, and Womble Carlyle.
- *Mobile App Challenge 2014,* UC Merced, $15k, with Career Services, gifts made by AT&T and IBM.
- *Blum Center UC Merced*, Endowment Fund, $100k, in collaboration Dean Mark A. Aldenderfer, School of Social Sciences, Humanities, and Arts, and development team, gift by Richard Blum.

- *Bright Scholars,* UC Merced, School of Engineering, $100k, in collaboration with development team, gifts by Calvin Bright to support engineering students with financial need.
- *Collaboration in Research and Education,* $10M/6 years, from American University of the Middle East, competed for and deployed locally as a portfolio of sponsored projects.

Arizona State University

Associate Dean for Research, Engineering 1995-1999

Charged with facilitating a dramatic increase in research activity during a critical phase of ASU's transformation from a teaching school to a research university. Supporting both new and seasoned faculty in developing increased extramural funding for their programs and grad students, especially larger scale interdisciplinary initiatives. Managing the research space and facilities assets were key.

Primary Responsibilities

- Supporting faculty in research and scholarship growth, via investments, incentives, accessible information, workshops, and teaming.
- Partnering across departments and colleges to develop agile processes for fostering a pipeline of signature research initiatives, seeding these groups, engaging industry, and supporting team efforts.
- Conceiving, advocating, and creating shared-use core facilities.
- Planning for expansion into new buildings and a new campus (Polytechnic),
- Managing existing space and facilities assets of the College, using data-driven decisions, to co-optimize the learning and discovery missions, creating dual-use space where appropriate.

Impact

- Set consecutive records for research expenditures, doubling in four years, changing the trajectory.
- Created four shared research facilities, two involving other Colleges (Science, Management).
- Integrated data from multiple sources to develop space utilization & research performance information; used to develop & administer incentives via overhead return, 8% to faculty and 8% to departments.
- Created and applied evaluation process for university-supported research centers, that resulted in sunsetting three of eight centers and redirecting funds to more strategic purposes.
- Stood up the Manufacturing Institute, a joint effort between Colleges of Management and Engineering.
- Facilitated team and proposal development (2 awards) for ERC, DARPA, SRC, and FAA $$M Centers.

Arizona State University

Vice-Chair for Aerospace, Acting Head of MAE 1989-1992, 1995

Charged with solidifying and then accelerating the new Aerospace Engineering program, guiding it through its second accreditation process, growing capacity, adding faculty. Continue growth and develop synergy among two programs in one academic unit, while preserving the independence and control required of ABET-accredited degree programs.

Primary Responsibilities

- Providing leadership for academics, administration, facilities, and finances for program/department.
- Recruiting and retaining faculty, supporting their transition into academic life, providing guidance on their pathway to promotion.
- Creating synergy between aerospace and mechanical degree programs, sharing courses as appropriate.
- Supervising curriculum and program development.
- Designing and implementing activities to engage and partner with industry.

Impact

- Managed process and achieved accreditation of the Aerospace Engineering BSE program
- Grew faculty by hiring aligned with strategic plan
- Created shared teaching lab facilities to support two degree programs, some with research dual-use.
- Co-taught Aerospace Engineering design with industry adjunct, launching long-standing partnership.

TEACHING AND MENTORING

Classroom Instruction

Passionate commitment to student learning, via both curricular and co-curricular experiences, with formal course instruction contributions during entire career. The following courses were taught (number of semesters shown) at Arizona State: ECE 100, Introduction to Engineering (1); ECE 106, Introduction to Computer-aided Engineering (3); ECE 340, Thermodynamics (6); ECE 382, Transport Phenomena (4); MAE 305, Measurements and Microcomputers (6); MAE 405, Microprocessor-aided Processes in Mechanical Engineering (6); MAE 456, Combustion (2); MAE 443, Engineering Design (3); MAE 468, Aerospace Systems Design (1); MAE 504, Laser Diagnostics (8). At Purdue responsible for: portions of ME 290 Professional Seminar (20); lectures in ENG 100 (20); and three sections of the capstone design course ME 463. At UC Merced: Professional Seminar ENGR 191 (8); and Capstone Projects ME 170 (5).

Course and Curriculum Development

- Envisioned, developed, and taught a number of courses that extend(ed) the domain of student personal growth far beyond that of then-current practices in academic offerings.

At ASU primary responsibility for developing the following courses for the MAE Department:

- MAE 405, Microcomputer-aided Processes in MAE, two lectures and a three-hour lab per week, elective. Topics included: microcomputer architecture; assembly code; input/output; data acquisition; D/A and A/D conversion; applications. Differentiating experience for MAE students before personal computers were used in lab instruction. Offered 1980-86.
- MAE 305, Measurements and Microcomputers, three lectures and a three-hour lab per week, required. Topics included measurement systems analysis, measurement uncertainty, sensors & transducers, microcomputer architecture, instruction sets, input/output, interfacing, data acquisition system fundamentals. As computers became ubiquitous, this successor to MAE 405 became a required undergraduate course, and the prerequisite for all MAE lab courses. Offered fall, 1990 – 2000, superseded by MAE 319.
- MAE 504, Laser Diagnostic Techniques. Laser/optical measurement techniques for combustion, fluids, heat transfer, and manufacturing. Lecture topics include electro-magnetic wave theory, laser fundamentals, Gaussian beam propagation, laser velocimetry, particle sizing, fiber optic sensors, imaging and holography, and surface inspection. Students learned sensor technologies that enabled previously-impossible measurements. Offered 1978-90.
- Design integration - in conjunction with other faculty of the Systems and Design Group developed an undergraduate engineering curriculum with a systematic integration of design content beginning with the freshman year and continuing through to the final senior design project course. In particular, integration of the philosophy into ECE 100, MAE 443 and MAE 468, the capstone mechanical and aerospace design courses.

At Purdue substantial course or curriculum development in the following:

- ME 463, Engineering Design. Co-developed and Offered Multidisciplinary project on Design/build of an Autonomous Vehicle (DARPA Grand Challenge), including students from Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering as well as ME students from Universität Karlsruhe, spring and fall, 2005.
- ME 463, Engineering Design. Developed distance collaborative design project on “Mini-Baja Steering Systems: A Global Platform Solution”, with students from Purdue and ITESM (Monterrey Tech) - Mexico City campus, fall, 2005.
- ME 463 Global Service Learning as Engineering Design, examples included the following:
  - Water System Design for Humatas de Anasco, Puerto Rico, an interdisciplinary, multi-university project involving 2 ME students and 2 CE students from Purdue, and 2 EE and 2 Biology students from U. Puerto Rico, Mayaguez. The Purdue students visited PR to define the project and build the

team. During the semester the project was performed via distance collaboration, and the team regrouped for a final presentation to the community;
  - Solar Oven for use in Tanzania, a senior design project in collaboration with non-profit Solar Circle, dedicated to improving life in Tanzania. The oven design requirements involved manufacturing with local materials and processes for the equivalent of $30US. Purdue's prototype was demonstrated with eight other designs at the Solar Cooking Technology Workshop in Morogoro, Tanzania.
  - Rainwater Harvesting and Solar Water Heating System for Tenwek Hospital, Bomet, Kenya. This involved a one-week site visit to Bomet, then work via distance collaboration.
  - Irrigation system for the Gashora Girls School in Rwanda, an interdisciplinary project joining Civil Engineering students at the National University of Rwanda in Butare with Purdue students. The team was co-located for a week in Rwanda in January, 2009, and then worked in distance collaboration for 2 semesters until the final system was deployed.
- ME 263/363/463 Design/Manufacturing Sequence. Initiated concept of Multiscale Manufacturing Center where manufacturing for mechanical engineers is viewed as covering the continuum of length scales from nano- to micro- to macroscale. In this framework the traditional student machine shop becomes the macroscale lab of the Center. With co-workers secured grants from National Science Foundation to develop a Microfabrication Lab within the Center so students in the ME 363 Principles and Practice of Manufacturing Processes could use soft lithography methods to fabricate microfluidic devices with 50 μm channels.
- ME 499/463 Global Design. Architect of the Global Engineering Alliance for Research and Education (GEARE) program where students from Purdue and partner universities (U. Karlsruhe, Shanghai Jiao Tong, and IIT Bombay) have two semesters of co-located global design team project experience, one at home and one abroad. Faculty from partner universities collaborate to team teach the course.

At UC Merced substantial course and curriculum development in:
- ENGR 191, Professional Seminar. Learning Outcomes related to Professional Ethics, Communications, and Engineering in Broader Context. About 1/3 of the lectures are delivered by instructor, 1/3 by UCM speakers, and 1/3 by professionals from outside UCM.
- ME 170 / ENVE 170 / BIOE 150 / MSE 120 / CSE 120 /MGT 180 Capstone Projects. Created and co-offered interdisciplinary team model, including formalized communication modes via preliminary, critical, and final design reviews and reports. Conceived and co-developed the *Innovation and Design Clinic* whereby regional industry and non-profits provide projects and mentoring for students. Integrated students from the Entrepreneurship/Management course with engineering teams, and in 2012 created a final design expo event *Innovate to Grow* now in its 6th year where each team does an elevator pitch, a video, a presentation, and a poster. Judges from venture and industry communities distribute $10k in prize money using a Fixed Allocation Chinese Auction. In Spring 2014 added the Wells-Fargo Food-Water-Energy Challenge which includes a $25k accelerator seed grant (for project with the most promise for commercialization). Enlisted a patent attorney as mentor, 8 teams have submitted provisional patent applications, linking to the UC's only course on *IP for Engineers and Scientists*.

Undergraduate Research Projects Advised

A university experience that helps students reach their full potential must go far beyond traditional coursework. To that end Prof. Hirleman has been active in supporting (twice NSF REU PI, plus raising gifts funds for similar initiatives) and advising undergraduate student research projects. His support has indirectly helped 100's of students. He has personally supervised more than 80 at ASU, Purdue, and UC Merced, resulting in ten local and regional awards for outstanding ASME student papers, plus additional publications and inventions.

Graduate Students Advised / co-Advised

1. H. K. Moon, "Response Characteristics of the Multiple Ratio Single Particle Counter," M.S.M.E., Aug, 1980. Head, Heat Transfer & Internal Air Systems, Solar Turbines.

2. Vince A. Ruscello, "Laser Diffraction Droplet Size Measurements Using a Photodiode Array," 1982-83. Global Productivity Solutions Inc., prev. Alcoa, Kraft Foods, and Seagate.
3. Phil F. Murtaugh, "Investigation of a Single Particle Velocity Measurement Concept," 1981-1983. CEO Coda Automotive, previously founding CEO, Shanghai-GM.
4. David Weber, "Light Scattering by Micron- and Submicron Spheres on Optically Smooth Surfaces," M.S.M.E., Dec., 1986. Patent Agent, Life Technologies, prev. MetroLaser, Inc.
5. Joseph. A. Koo (with R. Goulard, George Washington University), "Inverse Scattering Algorithms for Laser Diffraction Particle Size Measurements," Ph.D. (GWU), May, 1987. Senior Research Scientist, Advanced Manufacturing Center, University of Texas, Austin.
6. David A. Bridenstine (with B.W. McNeill), "PARDNER: An Engineering Process Test Bed," Ph.D. (M.E.), 1988. Research Engineer, Space Dynamics Laboratory, Logan, UT.
7. Paul Koury, "Simulation of an Optical Inspection System," M.S.M.E., May, 1988. Engineer, Honeywell, Inc.
8. Christopher LeBeau, "Digital Image Processing for Machine Vision and Inspection," Research Report, M.S.E. (M.E.), May, 1988. CEO, Imaging Technologies, Inc.
9. Franco Davis (with B.W. McNeill), "Expert Controller for the Design Process," M.S.M.E., August, 1990.
10. Keith Parsons, "Particle Size Measurements in Complex Flows," M.S.M.E., May, 1990. Engineer, Boeing Co.
11. Michael Ward (with R. Peck), "A Study of Sprays in Complex Flows," M.S.M.E., December, 1990. Senior Technical Sales Manager, Defense Systems, Honeywell, previously Combustion Engineering, Allied Signal and BMW Rolls-Royce, Berlin.
12. Steven Kenney, "Particle Diagnostics in Optically Thick Media," M.S.M.E., May, 1991.
13. Ravi Subrumanian, "Design for Inspectability," Research Report, M.S.E. (M.E.) Dec., 1996. CEO Micronest Software, Bangalore/Los Angeles.
14. Edward Bawolek, "Light Scattering by Rayleigh Particles on Surfaces," Ph.D. (E.E.), August, 1992. Flexible Display Center, Arizona State University, previously Intel Corp.
15. Mitchell Liswith, "Numerical Modeling of Light Scattering by Individual Submicron Spherical Particles on Optically Smooth Semiconductor Surfaces," SRC Fellow, M.S. (E.E.), August, 1994. CloudBlue Technologies, Inc., previously with Intel and IBM.
16. Thomas Warner, "Experimental Studies of Light Scattering by Particles on Surfaces," M.S.M.E., August, 1994. Engineering Manager, Apple, previously Engineering Group Leader, Intel and Samsung.
17. Michael Schneider (with D. Metzger and S. L. K. Wittig, Univ. Karlsruhe), "Heat Transfer in Turbine Cascades," Ph.D. (U. Karlsruhe), August, 1995.
18. Roland Schmehl (with S. L. K. Wittig, U. Karlsruhe), "Coupled-dipole Model for Light Scattering by Particles on Rough Surfaces," Dipl. Arb. (U. Karlsruhe), October, 1994. Associate Professor, Delft University of Technology, prev. with European Space Agency.
19. Carl Friedrichs (with S.L.K. Wittig, Univ. Karlsruhe), "Performance of an Aerothermally-optimized Turbine Blade," M.S.M.E., August, 1995.
20. Camiel Heffels (with B. Scarlett, Tech. Univ. Delft), "Azimuthal Variations in Scattering Patterns for Particle Shape Characterization," Ph.D. (TUD), November 1995. Engineer, BASF A.G., Germany.
21. Simon Schmittinger (with S. L. K. Wittig, Univ. Karlsruhe), "Nonablative Removal of Surface Particles with a Pulsed Laser Beam," Dipl. Arb. (U. Karlsruhe), 1996.

22. Benjamin Buckner, "Counting and Sizing Accuracy of Instruments for Surface Particle Characterization," M.S.E.E, May, 1996. Senior Scientist, MetroLaser, Inc.
23. Greg Starr, "Light Scatter by Particles on Bare, Patterned, and Rough Semiconductor Surfaces," Ph.D. (E.E.) December, 1997. IP Development Director, LSI Logic. Previously in engineering and management with Xilinx and Tabula.
24. Brent Nebeker, "Coupled-dipole Method for Scattering by Particles on Surfaces," Ph.D. (M.E.) August, 1998. Senior Engineer, Raytheon Corporation, Tucson, AZ.
25. Michael Jordan, "Light Scattering and Bulk Defects in Silicon Wafers," Ph.D. (E.E.), May, 2000. Business Dev. Mgr., Colibre Solutions LLC, prev. Senior Process Engineer, Motorola.
26. P. Ding, "Particle and Defect Detection on Chemical-Mechanical Polished (CMP) Wafers," Ph.D. (M.E.), May, 2000. Sr. App. Engineer, ASML Inc., previously Applied Materials.
27. Benjamin Buckner, "Quantitative Electron Scatterometry for in-line Nanoparticle Characterization," Ph.D. (E.E.) December, 2002. Senior Scientist, MetroLaser, Inc.
28. Songling Guo, "Optical Scattering for Bacteria Colony Detection and Characterization," M.S. (ME), May, 2004. Statistician, Legal and General America.
29. H. P. Zhang, "Modeling of Light Scattering from Features on and in Films and from Epitaxial Silicon Defects," Ph.D. (ECE), Aug, 2005. Engineering Manager, KLA-Tencor.
30. Muru Venkatapathi, "Electromagnetic Field Interactions with Microchannels, Particles, and Cells – Application to Advanced Cytometry," Ph.D. (ME) Dec, 2006. Asst. Professor, Supercomputer Education & Research Center, Indian Institute of Science (IISC), Bangalore.
31. Euiwon Bae, "Optical Forward Scattering for Bacterial Colony Differentiation and Identification", Ph.D. (ME) December, 2006. Research Assistant Prof., Purdue University.
32. Nan Bai, "Early Detection and Classification of Cells using Light Scattering," Ph.D. (ME), May 2012. Product Development Engineer, KLA-Tencor.
33. Tyler Williams, "Optimization of Photovoltaic-powered Deficit Irrigation," M.S. (ME) May, 2011. Engineer, Caterpillar.
34. Emily Wilson (with Carolin Frank, UC Merced), "Bacterial Endophytes in Conifers," Ph.D. (Quantitative Systems Biology), expected 2017.

Post-Doctoral Students/Researchers Advised

1. Paul E. Dellenback, Professor and Head, Department of Mechanical Engineering, University of Wyoming, Laramie, WY.
2. Yao Yue, technical staff, Spectron Development Labs, Costa Mesa, CA.
3. M. Volkan Otugen, Senior Associate Dean and George R. Brown Chair in Mechanical Engineering, Southern Methodist University, Dallas, TX.
4. H. Tan, President, consulting firm, Irvine, CA, prev. Spectron Dev. Labs, Costa Mesa.
5. Heike Mühlenweg, Research Engineer, Wolfe Laboratories, previously DeGussa AG.
6. Brent Nebeker, Senior Multi-Discipline Engineer, Raytheon Corporation, Tucson, AZ.
7. L. Suresh, Senior Development Engineer, Synopsis, previously with KLA-Tencor, Optisolar and Brion Technologies.
8. Muru Venkatapathi, Assistant Professor, Supercomputer Education and Research Center, Indian Institute of Science (IISC), Bangalore, India.
9. Euiwon Bae, Research Assistant Professor, Purdue University.

RESEARCH AND SCHOLARSHIP

Patents, Inventions, and Technology Transfer:

1. E. D. Hirleman and S.L.K. Wittig, "Multiple Ratio Single Particle Counter," Purdue University Patent Disclosure, November 11, 1975. ***U.S. Patent No. 4,188,121***, 1978.
2. E. D. Hirleman, "Technique for Simultaneous Particle Size and Velocity Measurements," Arizona State University Patent Disclosure, March 9, 1978, ***U.S. Patent No. 4,251,733***, 1981.
3. E. D. Hirleman, "Optical System for Time-of-flight Laser Velocimeter," U.S. Patent Application 06/417150, abandoned.
4. E. D. Hirleman, "Calibration Device and Technique for Laser Diffraction Particle Sizing," U.S. Patent Application 06/417487, abandoned. Resulting product is basis of ASTM and ISO Standards and Test Methods and is manufactured by Laser Electro-optics LLC, West Lafayette, IN. Approximately 1000 in use worldwide in automotive, propulsion, consumer product, food processing, cement, medical inhaler, and pharma industries.
5. E. D. Hirleman, "Programmable Detector Configuration for Fraunhofer Diffraction Particle Sizing Instruments," Arizona State University Patent Disclosure, December 22, 1986. ***U.S. Patent No. 5,007,737*****,** 1991. Assigned to the U.S.A. as represented by the Secretary of the Air Force.
6. E. D. Hirleman, "Successive Order Model for Multiple Scattering in Fraunhofer Diffraction Particle Sizing," Arizona State University Patent Disclosure, December 22, 1986. Incorporated into particle sizing instrument produced by Insitec, Inc. San Ramon, CA.
7. E. D. Hirleman, "Optimal Scaling for Fraunhofer Diffraction Particle Sizing Instruments," Arizona State University Patent Disclosure, December 22, 1986.
8. E. D. Hirleman and D. J. Holve, "Ensemble Diffraction Particle Sizing System with Axial Spatial Resolution," Arizona State University Invention Disclosure, February 14, 1989. ***U.S. Patent No. 5,101,113***, 1992. Licensed to Insitec, Inc. San Ramon, CA, with royalty stream to ASU.
9. B. Nebeker and E. D. Hirleman, "DDSURF/FFSURF: Scattering-Light Inspection System Model and Software," Arizona State University Invention Disclosure 98-101, Aug, 1997. Licensed to Hitachi Corp, royalty stream to ASU.
10. M. Jordan and E. D. Hirleman, "Bulk Defect Standard for Wafer Inspection Systems," Arizona State University Invention Disclosure, May 26, 1998.
11. G. W. Starr and E. D. Hirleman, "Particle Position Determination on Patterned Surfaces by Zeroth Order Diffraction Monitoring," Arizona State University Invention Disclosure, July 30, 1998.
12. L. Suresh, R. Diaz, and E. D. Hirleman, "Total Internal Reflection Scatterometer for Defect Detection on Transparent Substrates," Invention Disclosure 99-045, licensed to Intel Co, royalty stream to ASU.
13. Co-inventors and E. D. Hirleman, "Multispectral Discrimination of Particulates Using Single Particle Detection Methods from Air and Water Systems for Biodetection," Purdue University Invention Disclosure #63152, 2003.
14. Co-inventors and E. D. Hirleman, "High Speed Multispectral Discrimination Technology for Spectral Classification of Cells or Particles Suspended in Fluid", Purdue Invention Disclosure #63151, 2003.

15. E. D. Hirleman, S. Guo, A. K. Bhunia, and E. W. Bae, "System and Method for Rapid Detection and Characterization of Bacterial Colonies Using Forward Light Scattering," Purdue University Invention Disclosure #64142, 2004. ***U.S. Patent No. 7,465,560,*** 2008. Licensed to Indiana Technology Group, Purdue Research Park, West Lafayette, IN, royalty stream to Purdue.

16. J. P. Robinson, B. Rajwa, B. Bayraktar, A. K. Bhunia, E. D. Hirleman, and E. Bae, "System and Method of Organism Identification," Purdue University Invention Disclosure # 64405, 2005. ***U.S. Patent No. 8,787,633,*** 2014. Licensed to Indiana Technology Group, Purdue Research Park, West Lafayette, IN, royalty stream to Purdue.

17. E. D. Hirleman and J. Sanderson, "Medical Information Security Architecture and Trustee System", Purdue University Invention Disclosure, November 17, 2005.

18. E. D. Hirleman, B. Nebeker and H. P. Zhang, "DDEFILM/FFEFILM, Computational Electromagnetics Code for Modeling Light Scattering by a Feature Embedded in a Planar Thin Film on an Infinite Half-plane," Purdue University Invention Disclosure December 26, 2006. Licensed to Hitachi Corp, royalty stream to ASU and Purdue.

19. B. Nebeker and E. D. Hirleman, "DDSUB/FFSUB, Computational Electromagnetic Code for Modeling Light Scattering by a Feature Embedded Below the Surface of an Infinite Half-plane," Purdue University Invention Disclosure December 26, 2006. Licensed to Hitachi Corp, royalty stream to ASU and Purdue.

20. C.S. Chen, W.C. Chin, and E.D. Hirleman, "Application of Light Scattering Patterns to Determine Differentiation Status of Stem Cells and Stem Cell Colonies," University of California Case No. 2011-762-1, U.S. Provisional Patent Application No. 61/610,397, 2011, Patent Application filed under PTC, March, 2013.

Books Edited

1. E. D. Hirleman, W. D. Bachalo, and P. G. Felton (Editors), *Liquid Particle Size Measurement Techniques*, 256 p., American Society of Testing Materials, Philadelphia, PA, 1990.

Refereed Journal Publications - Education and Outreach

2. X. R. Zhang, T. S. Fisher, Y. C. Shin, and E. D. Hirleman and F. E. Pfefferkorn, "Integration of Microscale Fabrication in an Undergraduate Manufacturing Elective," International Journal of Engineering Education, Vol. 22, No. 2, pp. 343-349 (2006).

3. B. I. Allert, D. L. Atkinson, E. A. Groll, and E. D. Hirleman, "Making the Case for Global Engineering: Building Foreign Language Collaborations for Designing, Implementing, and Assessing Programs," Vol. 2, No. 2, Online Journal of Global Engineering Education, http://digitalcommons.uri.edu/ojgee/vol2/iss2/1, (2007).

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38. E. D. Hirleman, P. G. Felton, and J. Kennedy, "Results of the ASTM Interlaboratory Study on Calibration Verification of Laser Diffraction Particle Sizing Instruments using Photomask Reticles," pp. 611-620, Proceedings of the Fifth International Conference on Liquid Atomization and Spray Systems (ICLASS - 91), National Institute of Standards and Technology (NIST) Special Publication 813, U. S. Government Printing Office, Washington D. C., 1991.

39. M. J. Ward, J. A. Bossard, R. E. Peck, and E. D. Hirleman, "Spray Characterization in Axisymmetric, Swirling Combustor Flows," pp. 529-538, Proceedings of the Fifth International Conference on Liquid Atomization and Spray Systems (ICLASS - 91), National Inst. of Standards and Technology (NIST) Special Pub. 813, U. S. Govt. Printing Office, Washington D. C., 1991.

40. S. B. Kenney and E. D. Hirleman, "Calibration Factors for Laser Diffraction Ring Detectors: Theoretical Modeling," pp. 415-422, Proceedings of the Fifth International Conference on Liquid Atomization and Spray Systems (ICLASS - 91), National Institute of Standards and Technology (NIST) Special Publication 813, U. S. Government Printing Office, Washington D. C., 1991.

41. E. D. Hirleman, P. G. Felton, and J. Kennedy, "The Status of U.S. Efforts Toward Calibration Standardization for Laser Diffraction Instruments," pp. 655-671, Proc. of 5th European Symposium on Particle Characterization, K. Leschonski, Ed., Nürnberg Messe Gmbh, Nürnberg, FRG, 1992.

42. M. Schneider, E. D. Hirleman, H. I. Saleheen, D. Q. Chowdhury, and S. C. Hill, "Light Scattering by Radially Inhomogeneous Fuel Droplets in a High Temperature Environment," pp. 269-286, Laser Applications in Combustion and Combustion Diagnostics, L. Liou, Ed., SPIE 1862, Society for Photo-optical Instrumentation Engineers, Bellingham, WA, 1993.

43. M. Schneider, E. D. Hirleman, H. I. Saleheen, D. Q. Chowdhury, and S. C. Hill, "Rainbows and Radially-inhomogeneous Droplets," pp. 323-326, Proceedings of the Third International Congress on Optical Particle Sizing, M. Maeda, Editor, Keio University, Yokohama, Japan, 1993.

44. C. Heffels, D. Heitzmann, E. D. Hirleman, H. J. M. Kramer, and B. Scarlett, "Use of Azimuthal variations in Laser Diffraction Patterns for Particle Shape Characterization," pp. 23-28, Proc. of the 3rd International Cong. on Optical Particle Sizing, M. Maeda, Editor, Yokohama, Japan, 1993.

45. R. Kneer, S. Wittig, M. Schneider, and E. D. Hirleman, "Phase-Doppler Analysis of Multicomponent Evaporating Droplets," pp. 451-458, Proceedings of the Sixth International Conf. on Liquid Atomization and Spray Systems, Rouen, France, July, 1994.

Reviewed Publications - Semiconductor Manufacturing (selected)

46. D. C. Weber and E. D. Hirleman, "Sizing Fine Particles Deposited on Surfaces Using Light Scattering," Proc. of the First International Congress on Particle Sizing, Rouen, France, May, 1987.

47. D. C. Weber and E. D. Hirleman, "Measurements of Individual Micron and Submicron Particles on Surfaces using Light Scattering," pp. 127-134 in Optical Techniques for Industrial Measurement and Control, C. M. Penney and H. J. Caulfield, eds., IFS Springer-Verlag, New York, 1987.

48. E. D. Hirleman and D. C. Weber, "Light Scattering by Individual Micrometer and Submicrometer Particles on Surfaces," 20th Symp. on Opt. Materials for High Power Lasers, Boulder, Oct, 1988.

49. E. D. Hirleman, "Noncontact Characterization of Submicron Surface Features using Light Scattering," pp. 191-195, Proceedings of the NSF Design and Manufacturing Systems Conference," Society of Manufacturing Engineers, Dearborn, MI, 1990.

50. E. J. Bawolek and E. D. Hirleman, "Surface Roughness Effects on Light Scattered by Submicron Particles on Surfaces," pp. 574-583, Integrated Circuit Metrology: Inspection and Process Control V, Proceedings of SPIE, Vol. 1464, 1991.
51. E. J. Bawolek, J. B. Mohr, E. D. Hirleman, and A. Majumdar," Light Scatter from Polysilicon and Aluminum Surfaces and Comparison with Roughness Statistics by Atomic Force Microscopy," pp. 3-6, Surface Roughness and Scattering Technical Digest: Post Deadline Papers, Vol. 14, Optical Society of America, Washington, DC, 1992.
52. S. K. Schmittinger and E. D. Hirleman, "Non-ablative Removal of Surface Particles with a Pulsed Laser Beam," pp. 501-504, Proceedings of the 19th Annual Meeting of the Adhesion Society, T. C. Ward, Editor, ISSN: 1086-9506, The Adhesion Society, Myrtle Beach, SC, 1996.
53. G. W. Starr and E. D. Hirleman, "Comparison of Experimentally-Measured Differential Scattering Cross Sections of PSL Spheres on Flat and Patterned Surfaces," pp. 130-138, Flatness, Roughness, and Discrete Defect Characterization for Computer Disks, Wafers, and Flat Panel Displays, J. Stover, Editor, SPIE Vol. 2862, SPIE, Bellingham, WA, 1996.
54. B. M. Nebeker, G. W. Starr, and E. D. Hirleman, "Modeling of Light Scattering from Structures with Particle Contaminants," pp. 139-150 in SPIE Vol. 2862, Flatness, Roughness, and Discrete Defect Characterization for Computer Disks, Wafers, and Flat Panel Displays, J. Stover, Editor, SPIE, Bellingham, WA, 1996.
55. B. M. Nebeker, G. W. Starr, and E. D. Hirleman, "Modeling of Scattering from Arbitrarily-Shaped Features and Particles on Surfaces Using the Discrete-Dipole Approximation," pp. 41-42, Proc. of the Workshop on Light Scattering by Non-Spherical Particles, K. Lumme, J. W. Hovenier, K. Muinonen, J. Rahola, and H. Laitinen, Eds., Univ. Helsinki, 1997.
56. P. Ding, G. W. Starr, R. Chowdhury, and E. D. Hirleman, "Defect Characterization and Light Scattering by PSL Spheres on Tungsten CMP Wafers", pp. 50-60, SPIE Vol. 3215, In-line Characterization Techniques for Performance and Yield Enhancement in Microelectronic Manufacturing", SPIE, Bellingham, WA, 1997.
57. B. Buckner and E. D. Hirleman. "Surface Particle Detection for the 70 nm Generation and Beyond," p. 90-101 in Flatness, Roughness, and Discrete Defects Characterization for Computer Disks, Wafers, and Flat Panel Displays II, J. Stover, Ed, SPIE Vol. 3275, Bellingham, WA, 1998.
58. M. Jordan, R. E. Diaz, and E. D. Hirleman, "Analytical, first-order model of light scattering from submicron pyramidal pits," pp. 138-146, Metrology-Based Control for Micro Manufacturing, Proceedings of SPIE, Vol. 4275, 2000.
59. R. E. Diaz, B. M. Nebeker, E. D. Hirleman, "On-Wafer Measurement of Particles: Methods of Measuring Particles on a Wafer Surface," pp. 79-116, Contamination Free Manuf. For Semiconductors & Other Precision Products, Robert Donovan, Ed., Marcel-Dekker, 2001.
60. H. Z. Tan, B. D. Adelstein, R. Traylor, M. Kocsis, and E. D. Hirleman, "Discrimination of Real and Virtual High-Definition Textured Surfaces," Paper 1-4244-0226-3/06, 9 pages, Proceedings of IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, 2006.

Reviewed Publications - Biosensors (selected)

61. B. M. Nebeker, B. D. Buckner, E. D. Hirleman, A. Lathrop, and A. K. Bhunia, "Identification and Characterization of Bacteria on Surfaces using Light Scattering," pp. 224-234, Photonic Detection and Intervention Technologies for Safe Food, Proc. SPIE, Vol. 4206, 2001.
62. B. Rajwa, B. Bayraktar, P. P Banada, J. P. Robinson, A. K. Bhunia, E. D. Hirleman, "Noninvasive Forward-scattering System for Rapid Detection, Characterization, and Identification of Listeria colonies. Image-processing and Analysis," XXIII International Congress of the International Society for Analytical Cytology, 2005.

63. M. Venkatapathi, G. Grégori, J. P. Robinson, and E. D. Hirleman, "Measuring Size using Forward Light Scattering is not Straight-forward," XXIII International Congress of the International Society for Analytical Cytology, 2005.

64. B. Bayraktar, P. P. Banada, E. D. Hirleman, A. K Bhunia, J. P. Robinson, and B. Rajwa. "Bacterial phenotype identification using Zernike moment invariants," Paper 60800V, 8 pages, Advanced Biomedical and Clinical Diagnostic Sys. IV, Proc. SPIE, Vol. 6080, 2006.

65. B. Rajwa, M. Venkatapathi, K. Ragheb, P.P. Banada, E. D. Hirleman, T. Lary, and J.P. Robinson, "Automated Classification and Recognition of Bacterial Particles in Flow by Multi-angle Light Scattering and a Support Vector Machine Classifier," paper 64410O, 7 pages, Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues V, Proc. of SPIE, Vol. 6441, 2007.

66. E.W. Bae, P.P. Banada, A.K Bhunia, and E.D. Hirleman, "Label-free Detection of Multiple Bacterial Pathogens using a Light Scattering Sensor," 21st International Committee on Food Microbiology and Hygiene, P158, 2008.

67. E.W. Bae, P.P. Banada, A.K Bhunia, and E.D. Hirleman, "Development and Optimization of Two-dimensional Centering Algorithm for the Bacteria Rapid Detection using Optical Scattering Technology (BARDOT) Platform," Paper 684905, 8 pages, Design and Quality for Biomedical Technologies, Proceedings of SPIE, Vol. 6849, 2008.

68. B. Rajwa, B. Bayraktar, P.P. Banada, K. Huff, E.W. Bae, E.D. Hirleman, A.K. Bhunia, and J.P. Robinson, "Phenotypic Analysis of Bacterial Colonies using Laser Light Scatter and Pattern-Recognition Techniques," Paper 68640S, 7 pages, Biomedical Applications of Light Scattering II, Proceedings of SPIE, Vol. 6864, 2008.

69. B. Rajwa, M. Dundar, V. Patsekin, K. Huff, A.K. Bhunia, M. Venkatapathi, E.W. Bae, E.D. Hirleman, J. Robinson, "Morphotypic Analysis and Classification of Bacteria and Bacterial Colonies using Laser Light Scattering, Pattern Recognition, and Machine-learning System," Paper 73061A, 7 pages, Optics and Photonics in Global Homeland Security V, Proc. of SPIE, Vol. 7306, 2009.

70. E.W. Bae, N. Bai, A. Aroonnual, A.K. Bhunia, J.P. Robinson and E.D. Hirleman, "Prediction of Light Scattering Patterns from Bacterial Colonies by a Time-resolved Reaction-diffusion Model and Scalar Diffraction Theory," Paper 73150A, 7 pages, Sensing for Agriculture and Food Quality and Safety, Proceedings of SPIE, Vol. 7315, 2009.

71. N. Bai, E.W. Bae, A. Aroonnual, A.K Bhunia, J.P. Robinson, E.D. Hirleman, "Development of a Real-time System of Monitoring Bacterial Growth and Registering the Forward Scattering Pattern," Paper 73150Z, 8 pages, Sensing for Agriculture and Food Safety, Proc. SPIE, Vol. 7315, 2009.

72. M. M. Dundar, E. D. Hirleman, A. K. Bhunia, J. P. Robinson, and B. Rajwa, "Learning with a Non-Exhaustive Training Dataset. A Case Study: Detection of Bacteria Cultures using Optical-scattering Technology," pp. 279–288, Proceedings of the 15th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Paris, France: ACM. doi:10.1145/1557019.1557055, 2009.

73. N. Bai, E.W. Bae, A. Aroonnual, A.K Bhunia, J.P. Robinson and E.D. Hirleman, "Morphology Characterization of Bacterial Colonies for Predicting Forward Scattering Patterns," Topical Meeting of Optical Society of America: Optical Sensors, 2010.

74. J.P. Robinson, B.P. Rajwa, E. Bae, V. Patsekin, A.M. Roumani, A.K. Bhunia, J.E. Dietz, V.J. Davisson, M.M. Dundar, J. Thomas and E.D. Hirleman, "Using Optical Scattering to Identify Bacterial Pathogens," pp. 20-27, Optics and Photonics News, October, 2011.

75. J.P. Robinson, B.P. Rajwa, E.W. Bae, V. Patsekin, A.M. Roumani, A.K. Bhunia, J.E. Dietz, V.J. Davisson, M. Dundar, J. Thomas, E.D. Hirleman, "Rapid Microbe Colony Identification by Optical Scattering," Lasers and Interactions with Particles (LIP - 2012), INSA de Rouen, Mar., 2012.

Invited Review Papers at National and International Meetings/Workshops:

1. E. D. Hirleman. "Laser Light Scattering Methods for Particle Sizing," Society for Instrumentation and Control of Energy Processes Symposium, Livermore, CA, April, 1981.
2. E. D. Hirleman, "Laser-based Single Particle Counters in In-Situ Particulate Diagnostics," Annual Conference of the Aerosol Research Association, Santa Monica, CA, Feb, 1982.
3. E. D. Hirleman. "Laser-based Particle Sizing Techniques," Department of Energy Workshop on Coal Combustion, Pittsburgh, PA, June 1982.
4. E. D. Hirleman, "Nonintrusive Laser Particle Sizing Techniques," AIAA 18th Thermophysics Conference, June, 1983, Montreal, Canada.
5. E. D. Hirleman, "Particle Sizing by Optical, Nonimaging Techniques," ASTM Conference on Sizing Liquid Particles, Kansas City, KS, June, 1984
6. E. D. Hirleman, "Laser Diffraction Particle Sizing Techniques," Sixth International Congress on Lasers and Electro-optics, Washington, DC, November, 1986.
7. E. D. Hirleman and P. A. Dellenback, "Faraday-effect Light Valve Arrays for Adaptive Optical Instruments," 7th Int'l. Cong. on Lasers & Electro-optics, San Diego, Nov., 1987.
8. E. D. Hirleman, "Optical Diagnostics," Atomization and Sprays 2000, Workshop sponsored by the National Science Foundation, Gaithersburg, MD, July, 1991.
9. E. D. Hirleman, "Characterization of Surface Defects using Light Scattering," ASTM Symposium on Detection of Particles on Surfaces, Minneapolis, MN, June, 1993.
10. E. D. Hirleman, "Light Scattering by Particles on Surfaces," Plenary Lecture, Third International Congress on Optical Particle Sizing, Yokohama, Japan, August, 1993.
11. E. D. Hirleman, "Summary of the Third Congress," Plenary Lecture, Third International Congress on Optical Particle Sizing, Yokohama, Japan, August, 1993.
12. E. D. Hirleman, "Correlation of Surface Statistics by Atomic Force Microscopy and Angle-resolved Scattering from Semiconductor Substrates," Workshop on Industrial Applications of Scanned Probe Microscopy, NIST, Gaithersburg, MD, December, 1994.
13. E. D. Hirleman, "The Past, Present, and Future of Phase Doppler Sizing Anemometry," Opening Plenary Lecture, Sixth International Congress on Liquid Atomization and Spray Systems, (ICLASS '94), Rouen, France, July, 1994.
14. E. D. Hirleman, "On the Invention and Development of the Phase-Doppler Sizing Anemometer," 4th Int'l Congress on Optical Particle Sizing, Nürnberg, FRG, March, 1995.
15. B. M. Nebeker and E. D. Hirleman, "Light Scattering by Particles and Defects on Surfaces: Semiconductor Wafer Inspection." Laredo Workshop on Light Scattering from Microstructures - Summer School of Laredo, University of Cantabria, Laredo, Spain, 1999.
16. E. D. Hirleman, "GEARE: A Comprehensive Program for Globalizing Engineering Education," German Academic Exchange Service Workshop, Columbia U., New York, June, 2003.
17. E. D. Hirleman, "Multiscale Manufacturing Center," NSF Workshop on Nanoscale Mechanical Engineering, NSF Nanomanufacturing Program, June, 2003.
18. G. Chiu, E. A. Groll, and E. D. Hirleman, "The Global Workforce: The Future of Technological Education," ABET Annual Meeting, Lake Tahoe, NV, November, 2007.
19. B. Rajwa, B. Bayraktar, P.P. Banada, K. Huff, E.W. Bae, E.D. Hirleman, A.K. Bhunia; and J.P. Robinson, "Phenotypic Analysis of Bacterial Colonies Using Laser Light Scatter and Pattern Recognition Techniques," 24th Congress of Intl. Soc. for Analytical Cytology, Budapest, May, 2008.

20. M.M. Dundar, B. Rajwa, E.D. Hirleman, A.K. Bhunia, and J.P. Robinson, "Learning with a Non-Exhaustive Training Dataset: Detection of Bacteria Cultures using Optical-Scattering," 15th ACM SIGKDD Conf. on Knowledge Discovery & Data Mining, Paris, June, 2009.
21. E.D. Hirleman, et al, "Rapid Microbe Colony Identification by Optical Scattering," Laser Interactions with Particles, LIP 2012, INSA de Rouen, France, March, 2012.
22. E.D. Hirleman, "Integrating Innovation and Entrepreneurship into Campus Culture and Curricula," Epicenter Workshop, NCIAA 18th Ann. Meeting, San Jose, CA, March, 2014.

Other Invited Lectures and Seminars:

- "Information, Sustainable Energy, and Global Engineering," Research Exchange Seminar, Center for IT Research in the Interest of Society (CITRIS), University of California, Berkeley, 2011.
- "Busting Bugs: Label-free Identification of Cells and Microbial Colonies via Laser Scatter," The Pellissier Family Distinguished Speaker Series, UC Merced Research Week, Public Lecture, 2011.
- In addition, Prof. Hirleman has presented more than 90 invited lectures and seminars at university, government, and industry in 14 countries. Topics of these lectures include: laser diagnostics; design education; fund raising and development; academic administration; economic development; international standards; and global engineering education as below:
- *United States:* 3M Corporation, Applied Materials, Army, Department of Agriculture, Department of Energy, Imation Inc., In-systems Inc, Intel Corporation, Kansas State University, KLA Instruments Inc., Massachusetts Institute of Technology, Motorola Inc., National Bureau of Standards, North Carolina State University, Optical Specialties Inc, Purdue University, Sandia National Laboratories, Southwest Research Institute, Tencor Instruments, Univ. of Arizona, Univ. of California - Berkeley, Univ. of California - Irvine, Univ. of Houston, Univ. of Minnesota, Univ. of Nebraska, Univ. of North Carolina - Charlotte, Univ. of Washington.
- *International:* Beijing Institute of Aeronautics & Astronautics, Chinese Academy of Sciences, Shanghai Jiao Tong University, China; Technical University of Denmark, Risø National Laboratory, Denmark; Compagnie Industrielle des Lasers (CILAS), University of Rouen, Institut Franco-Allemand de Recherchés de Saint-Louis (ISL), France; Daimler-Benz, Motoren und Turbinen Union (MTU), Wacker - Chemitronics GmbH, Universität Bremen, Universität Duisburg, Universität Karlsruhe, Universität Stuttgart, Germany; Technical Univ. Delft; Dutch Particle Characterization Working Group, Holland; Technical University Budapest, Hungary; Birla Institute of Technology - Hyderabad, GMR Foundation, IIT Rajasthan, Ministry of New and Renewable Energy (MNRE), India; Technion - Israeli Inst. of Technology, Israel; Japanese Soc. of Mechanical Engineers (JSME), Hitachi Research Labs, Sumitomo Sitix Co., Japan; Polish Acad. of Sciences, Poland; Rwanda Ministry of Agriculture, National University of Rwanda - Butare, Rwanda; Royal Inst. of Technology, Sweden; Atomic Energy Research Establishment (AERE), Imperial College, National Gas Turbine Research Establishment, Sharp Corp. Research of Europe, Shell-Thornton Research Center, University of Sheffield, U.K.

ENGAGEMENT AND SERVICE

Journal Editorships

- Topical Editor, *Applied Optics*, 1991-1993, 1994-1996.
- Editor, *Applied Optics* Special Issue on Optical Particle Sizing, September, 1991.
- Advisory Editorial Board, *Particle Characterization*, 1988-1994.

Conference and Symposium Activities

- Lead Organizer, Session on *International Programs*, and Member, Planning Committee, 2012 ASEE Engineering Deans Institute (EDI), Kauai, HI, April 15 - 18, 2012.
- Leader, Session on *Scalable Approaches to Global Education*, 2010 International Mechanical Engineering Education Conference, Newport Beach, CA, March 26-28, 2010.

- Member, Steering Committee, Thirteenth Annual Colloquium on International Engineering Education, Newport, RI, November 4-7, 2010.
- Co-Chair, National Conference, Engineers for a Sustainable World, Purdue University, West Lafayette, IN, Oct 7-10, 2010.
- Member, Steering Committee, Twelfth Annual Colloquium on International Engineering Education, Ames, IA, October 22-25, 2009.
- Member, Steering Committee, Eleventh Annual Colloquium on International Engineering Education, Newport, RI, November 6-9, 2008.
- Co-chair, National Summit Meeting on the Globalization of Engineering Education, NSF sponsored workshop. Outcomes include the *Newport Declaration* and proceedings available at http://globalhub.org/nationalsummit2008. Newport, RI, November 5-6, 2008.
- Chair, Panel on *Making Global Programs Work*, 2008 International Mechanical Engineering Education Conference, Galveston, TX, April 4-8, 2008.
- Chair, International Research and Education in Engineering (IREE) 2008 NSF Grantees Conference, Washington, DC, May 2-3, 2008.
- Member, Steering Committee and Local Arrangements, Tenth Annual Colloquium on International Engineering Education, November 1-4, 2007, West Lafayette, Indiana. Organized and facilitated Workshop on Cyber-community for global engineering education (GlobalHUB). Chair, Session on *Industry Perspective on Needs for Global Aspects in the Engineering Curriculum.*
- Chair, Session on *Leading Change in Engineering Departments* in Department Leadership Workshop, 2007 Int'l Mech. Engineering Education Conference, Dorado, Puerto Rico, Mar, 2007.
- Chair, International Research and Education in Engineering (IREE) NSF Grantees Conference, Purdue University, West Lafayette, IN, Oct 30 – Nov 1, 2007.
- Scientific Committee, Eighth International Cong. on Optical Particle Sizing, Graz, Austria July, 2007.
- Steering Committee, Ninth Annual International Colloquium on International Engineering Education, Newport, Rhode Island. Chair, Session I on Defining the Global Engineer, Nov, 2006.
- US Chair, Joint Chinese Mechanical Engineering Society (CSME) - ASME Education Conf., March, 2006, Beijing, China. Attended by some 200 engineering deans and department heads from China. Plenary speakers included President of the Chinese Academy of Engineering, the Minister of Education of China, and the Chair of engineering accreditation programs in China.
- Steering Committee, Eighth Annual International Colloquium on International Engineering Education, November, 2005, Atlanta, Georgia. Organized Workshop on Defining Global Engineering Competency.
- Steering Committee, Seventh Annual International Colloquium on International Engineering Education, Providence, RI, November, 2004.
- Scientific Comm., Seventh Int'l Congress on Optical Particle Sizing, Kyoto, Japan, August, 2004.
- Scientific Committee, Sixth International Congress on Optical Particle Sizing, Brighton, UK, April, 2001.
- Scientific Comm., Fifth Int'l Congress on Optical Particle Sizing, Minneapolis, MN, Aug, 1998.
- Scientific Comm., Fourth Int'l Congress on Optical Particle Sizing, Nürnberg, Mar, 1995.
- Scientific Comm., Third Int'l Congress, Optical Particle Sizing, Yokohama, Japan, August, 1993.
- Chair, Second International Congress on Optical Particle Sizing, Tempe, AZ, March, 1990.
- Chair, Second ASTM Symposium on Liquid Particle Size Measurement Techniques, Atlanta, GA November, 1988.
- Chair, Symposium on Flow and Particle Diagnostics, 6th International Congress on Lasers and Electro-optics, San Diego, CA, November, 1987.
- Scientific Committee, First International Congress on Particle Sizing, Rouen, France, May, 1987.
- Chair, Symposium on Flow and Particle Diagnostics, 5th International Congress on Lasers and Electro-optics, Arlington, VA, November, 1986.
- Program Committee, Particle Sizing and Spray Analysis Symposium, SPIE Conference on Optical and Electro-Optical Engineering, San Diego, CA, August, 1985.
- Chair, Session Aides and Local Arrangements, 28th ASME International Gas Turbine Conference, Phoenix, AZ, March, 1983.

- Session Chair, Symp. on Engineering Applications of Laser Velocimetry, ASME Winter Annual Meeting, Phoenix, AZ, Responsible for Student Program, Local Arrangements, and Session Aides, Nov. 1982.
- Chair, Local Arrangements, Fall 1981 Meeting of the Western States Section, Combustion Institute, Tempe, AZ, October, 1981.

Reviewer

- Reviewer of Technical Papers and Proposals for: AIAA Journal; Applied Optics; Army Research Office; Combustion Institute, Experiments in Fluids; Journal of Applied Physics; Journal of Energy; Journal of Optics, Journal of the Optical Society of America; Journal of Vacuum Science and Technology; Measurement Science and Technology; National Science Foundation; Optics Letters; Particle and Particle Systems Characterization; Technological Options for User-Authorized Handguns: A Technology-Readiness Assessment, NAE Report.
- Program Reviewer: Mechanical and Aerospace Engineering Graduate Program, North Carolina State University; Lead Evaluator, International Plan, Georgia Institute of Technology accreditation, Southern Association of Colleges and Schools (SACS); Graduate Program, Department of Mechanical Engineering, Virginia Tech; Chair, Comprehensive 5-year External Review Panel, School of Mechanical Engineering, Shanghai Jiao Tong University.

Professional and Honorary Societies and Organizations, Membership and Service

- Director, Engineers for a Sustainable World, 2010-2013, Chair, Advisory Board, 2010-2013, Vice Chair, Advisory Board, 2009-10, Member, Advisory Board 2013-, Chair, Fund Raising and Board Development subcommittees, 2009-11.
- Advisory Board, South Asia Regional Task Force on Renewable Energy, formed to facilitate public private partnership (PPP) for developing specific projects in South Asia, 2010-2013.
- Founding Faculty Advisor, Purdue Chapter, Engineers for a Sustainable World, 2008-10.
- Member, Executive Committee, Confucius Institute at Purdue University, 2007-10.
- Chair, Global Strategy Task Force, 2007-10; Member, Executive Committee, Mechanical Engineering Dept. Heads, Center for Education, ASME, 2005-08. Multiple activities including education (symposia organization) and mentoring for new department heads and faculty.
- Steering Committee, American National Standards Institute (ANSI) Nanotechnology Standards Panel, 2004-2006.
- ASTM International Committee E56 on Nanotechnology, 2004-2007.
- Member, Advisory Council, University of Texas ME Department, 2002-2005.
- Member, Academic Advisory Council, Industrial Research Institute, Washington, D.C., 2001-04.
- Co-chair, Defect Metrology Working Group, International Technology Roadmap for Semiconductors, 1996-1999.
- American Institute of Aeronautics and Astronautics; Academic Affairs Committee, 1989-92; Propellants and Combustion Technical Committee, 1989-92; Sensor Sys. Tech. Comm., 1989-92.
- American Institute of Physics, 1979-.
- American Society of Testing Materials, Subcommittee E29.04 on Liquid Particle Sizing Techniques, 1978-1995; Subcommittee F1.06 on Silicon Materials, 1990-2001.
- American Society of Mechanical Engineers: Faculty Advisor, Student Section, Arizona State University, 1982-83; University Relations Chair, Arizona Section, 1982-84; Professional Development, Arizona Section, 1985-87.
- International Standards Org. (ISO) Tech. Committee 24 on Particle Characterization, 1988-1995.
- Optical Society of America, Society of Photo-Optical Instrumentation Engineers.
- The Combustion Institute, Executive Committee, Western States Section, 1979-87.
- Pi Tau Sigma (Mechanical Engineering Honorary).
- Tau Beta Pi (Engineering Honorary).

Short Courses and Workshops

- Workshop Organizer, "Scalable Approaches to Global Education", 2010 International Leadership Summit – Multi-Disciplinary Engineering Education, ASME, Istanbul, Turkey - May 26-29, 2010.
- Workshop Organizer, "Scalable Approaches to Global Education", 2010 International Mechanical Engineering Education Conference, ASME, Newport Beach, CA, March 27-31, 2010.
- Lecturer, "Assessment of the Global Dimensions of Engineering: Research Component", National Science Foundation, Washington, DC, February 16, 2010.
- Seminar Panelist, "Global Partnering in Engineering Education," 2009 ASME Annual Meeting, Palm Desert, CA, June 13-17, 2009.
- Workshop Organizer and Lecturer, "Global Strategy for ME Department Heads", 2009 International Mechanical Engineering Education Conference, ASME, Hilton Head, SC, March 27-31, 2009.
- Panelist, "Tips for New and Prospective ME Department Heads," IMECE 2007, Seattle, WA.
- Course co-Director, "Strategies to Reach Global Engineering Professional Competence", 8th Annual Colloquium on International Engineering Education, Atlanta, Georgia, November, 2005.
- Lecturer, "Light Scattering by Particles on Surfaces," Univ. Minnesota, Minneapolis, Aug., 1998.
- Lecturer, "Light Scattering by Particles and Defects on Surfaces: Semiconductor Wafer Inspection," International Workshop on Light Propagation and Scattering in Dense Media and Rough Surfaces, Laredo, Spain, September, 1998.
- Course Director and Lecturer, "Optical Measurements of Particles and Sprays," Technical University of Delft, The Netherlands, May 25-27, 1994.
- Lecturer, "Applications of Scanned Probe Microscopy," National Institute of Standards and Technology (NIST), Gaithersburg MD, March 24-25, 1994.
- Course Director and Lecturer, "Optical Measurements of Particles and Sprays," Technical University of Delft, The Netherlands, January 12-15, 1993.
- Lecturer, "Particle and Flow Diagnostics," Carnegie-Mellon University, May 14-16, 1990.
- Lecturer, "Particle and Flow Diagnostics," Carnegie-Mellon University, April 21-23, 1987.
- Lecturer, "Laser Diagnostics of Sprays," Carnegie-Mellon University, April 30 - May 2, 1984.
- Lecturer, "Laser Instrumentation for Aerosol Measurement," University of Tennessee Space Institute, Tullahoma, TN, April 19-23, 1982.
- Lecturer, "Droplet Sizing Methods," Short Course, Spectron Dev. Labs, Irvine, Nov. 9-10, 1981.
- Course Director and Lecturer, "Combustion Evaluation for Air Pollution Control," EPA Short Course for Air Pollution Engineering Los Angeles, CA, August 7-11, 1980.
- Lecturer, "Theory and Application of the Laser Velocimeter," University of Tennessee Space Institute, Tullahoma, TN, June 23-27, 1980.
- Course Director and Lecturer, "Combustion Evaluation for Air Pollution Control," EPA Short Course for Air Pollution Engineering, Davis, CA, February 4-8, 1980.
- Course Director and Lecturer, "Combustion Evaluation for Air Pollution Control," EPA Short Course for Air Pollution Engineering, Tempe, AZ, September 10-14, 1979.

Leadership – University Activities

- Member, one of four members on the Contract Review Board, to review and adjudicate requests for non-standard contract terms for sponsored projects, including intellectual property terms, 2014-
- Chair, Project 2020 Subcommittee on Academic Space Planning, 2013-14, Committee providing academic space requirements as input to Project 2020, a novel Public-Private Partnership concept that is UC Merced's approach to dealing with campus growth in a highly-constrained fiscal environment. The UCM vision is to establish itself as a competitive research university with 10,000 students by 2020, while tripling graduate enrollment. The vision is for one RFP for build-out of the 2020 Master Plan.
- Chair, Search Committee for Vice Provost for the Faculty, Univ. of California, Merced, 2013-14.
- Chair, Search Committee for Dean, School of Natural Sciences, University of California, Merced, 2010-11, Hired Dr. Juan Meza.

- Member, Steering Committee, Sustaining New Synergies, 2009-2010, Committee of 16 co-chaired by provost and VP/Treasurer formed to develop recommendations for sustaining investments in strategic plan in context of general fund budget shortfalls.
- Chair, Globalization Working Group, one of 8 focus areas in Purdue's 2008-2014 Strategic Plan, and representative for that Group on 18-member Strategic Plan Steering Committee, Purdue Univ., 2007-08. Led Working Group in developing White Paper on Globalization, using input from students, staff, faculty, alums, and community reps via web-based and public open forums. Participated with Steering Committee in drafting the final Plan approved in June, 2008.
- Inaugural Chair, Finance Team, College of Engineering, Purdue Univ., 2004-2006 (and Member, 2006-07). Established team of three School heads and three faculty with mission of converting from an incremental, legacy-based budget to a performance-based system for budget distributions within the College of Engineering. The Team was also charged with proposing methods to identify new sources of revenue and recommending methods to reduce duplication. Budget model created and recommendations for changes to increase revenue adopted, used in annual budgeting process for at least ten years.
- Inaugural Chair, Nanotechnology Signature Area Faculty Search Committee, Schools of Engineering, Purdue University, 2003-05. Inter-School Committee with representatives from Physics, Chemistry, Biology, Pharmacy, and six Schools of Engineering to recruit 15 faculty in 5 years into the Nanotechnology area. Created taxonomy for nanotech cluster at Purdue including: Nanomaterials and Metrology; Nanodevices; Nanophotonics; and Nanosystems Integration. Six faculty recruited (into ChE, ECE, ME, and MSE) in first year.
- Co-Chair, College of Engineering Committee on Emerging Educational Opportunities: Engineering Excellence 2000, Arizona State University, 1994-95.
- Inaugural Chair, College of Engineering Committee on Teaching Evaluations and Awards, ASU, 1987-89. Formed committee and developed procedures for teaching evaluation and awards based on peer review supplemented by student evaluations. Awards initiated in spring, 1988.
- Chair, Undergraduate Affairs Committee, Mechanical and Aerospace Engineering Department, Arizona State University, 1988-90.
- Chair, Facilities and Space Committee, Mechanical and Aerospace Engineering Dept., Arizona State University, 1990-91, 1993-94.
- Chair, Systems and Design Group, Mechanical and Aerospace Engineering Department, Arizona State University, 1984-85.

University Committees

- Member, Business Process Reengineering Committee, Purdue, 2016-
- Member, Search Committee for Associate Vice Chancellor for Research, University of California, Merced, 2013-14.
- Member, Search Committee for Vice Chancellor for Business and Administrative Services, University of California, Merced, 2013-14.
- Member, Compensation Strategy Committee, 2013-14
- Member, Search Committee for Vice Chancellor for Planning and Budget, University of California, Merced, 2012-13.
- Member, Sustaining New Synergies Steering Committee, Purdue University-wide group of 24 addressing the challenges of funding the Strategic Plan under budgetary constraints, 2009-2010.
- Member, Diversity Action Committee, College of Engineering, Purdue, 2004-2010.
- Member, Head Evaluation Process Committee, College of Engineering, Purdue, 2002-03.
- Member, College of Engineering Committee on Space Utilization, Arizona State Univ., 1994-95.
- Member, Sunset Review Committee for the Center for Advanced Transportation Systems Research, chartered by the VP for Research and ASU Committee on Research and Creative Activities, 1994-95.
- Member, University Committee on Patents and Trademarks, 1981-84, 1987-90.
- Member, Committee on Radiation Safety, Arizona State University, 1981-84.
- Member, College of Engineering Graduate Council, Arizona State University, 1989-91.

- College of Engineering Retention Committee, Arizona State University, 1989-91.
- Member, College of Engineering Core Curriculum Committee, Arizona State Univ., 1988-90.
- Member, College of Engineering Grievance Committee, Arizona State University, 1987-90.
- Member, Coll. of Engineering Committee on Student Dishonesty, Arizona State Univ., 1980-82
- Member, College of Engineering ECE 333 (Instrumentation) Committee, Arizona State, 1987-90.
- Member, ECE 340 (Thermodynamics) Committee, Arizona State University, 1980-83.
- Representative of Mechanical and Aerospace Engineering, Arizona State Faculty Senate, 1981-83.

Industrial and Consulting

- Consulting on laser and electro-optical systems for: Argonne National Laboratory; Digital Equipment Corp.; Dynamics Technology Inc., Garrett Turbine Engine Co.; KVB, Inc.; Laser Electro-Optics Ltd. (principal); Metrolaser, Inc., Phelps Dodge Corporation; and Spectron Development Laboratories.
- Principal in Laser Electro-optics LLC, an entity that manufactures optical devices (photomask calibration reticles) for particle sizing instruments based on technology developed at ASU.

Other Service

- Engineering Chair, Purdue United Way Campaign, 2005.
- Faculty Advisor, Purdue Racquetball Club, 1999-2010. Purdue's teams finished in top 20 several times in intercollegiate national championships.
- President, The Aslan Society, Arizona State University, 1998-99.
- Faculty Advisor, ASU Racquetball Club, 1990-92.
- President (Founding), Kairos Ministries Inc., 1988-2004, organization providing one-on-one counseling, tutoring, worship services, post-incarceration job placement service, and other assistance to inmates and their families. Organization in contact with about 1000 inmates of Arizona county/state jails per month.
- Faculty Advisor, ASU International Students Club, 1978-92, 1993-99.

SPONSORED PROGRAM FUNDING

Education and Outreach (PI unless otherwise noted):

1. "Software for TI 990 Microcomputer," Texas Instruments, 1/80-1/81, $9,000.
2. "Digital Signal Processing Equipment," TRW Inc., LSI division, equipment grant 6/5/81, $2,737.
3. "Equipment to Support Microcomputer Education in Mech. Eng.," Texas Instruments, 9/81, $2,000.
4. "Optical Inspection in Manufacturing," Garrett Turbine Engine Co., 7/84-1/85, $10,000.
5. "CCD Camera and Equipment for Computer-integrated Manufacturing," 2/83, Fairchild Corp., $3,000, and Dorner Mfg. Co., $1,000.
6. "PARDNER: Engineering Process Metrics," with B.W. McNeill, McDonnell-Douglas Helicopter, 10/87-10/88, $60,000.
7. "Research on the Engineering Process," with B.W. McNeill, 10/88-3/89, McDonnell-Douglas Helicopter Co., $40,000.
8. "2nd International Cong. on Optical Particle Sizing," National Sci. Foundation, 1/90-12/90, $10,000.
9. "Artificial Intelligence and the Engineering Design Process," with B.W. McNeill, McDonnell-Douglas Helicopter, 1/90-12/90, $60,000.
10. "Global Engineering Alliance for Research and Education (GEARE), Industry Partners Program" Cummins, Dow, Ford, GM, John Deere, Shell, Siemens, United Technologies, $20k per year, 2003-2008, total $780,000k.
11. "SGER: Development of a Multi-Scale Manufacturing Teaching Laboratory," with T. Fisher (PI), X. Xu, S. Wereley, and A. Raman, 9/1/03 – 8/31/05, National Science Foundation, $99,998.

12. "Global-HUB: A Virtual Community for Global Engineering, Education, Research, and Collaboration", with J. Bøhn, D. Dutta, E. Groll, and J. Lucena, 10/07-9/09, Engineering Virtual Organization (EVO) Program, National Science Foundation, $190,000.
13. "International Research and Education in Engineering (IREE) 2007 Grantees Conference," Oct 30-Nov 1 2007, Purdue University, 9/07-3/08, National Science Foundation, $49,995.
14. "International Research and Education in Engineering (IREE) 2008 Grantees Conference," May 2-3, 2008, Washington, DC, 3/08-8/08, National Science Foundation, $49,940.
15. "GlobalHUB.org", 1/1/10-12/31/10, Motorola Foundation, $100,000.
16. "IREE: Developing Globally Competent Engineering Researchers," E. D. Hirleman (PI) and 2 others, 1/10/10-3/31/11, National Science Foundation, $959,736.
17. "S-STEM Scholars of Purdue: Program to Promote and Sustain Interest in Engineering Through Engaging in Experiential Learning," with T. Reed-Rhoads (PI), E.D. Hirleman and 3 others, 5/09 – 4/13, National Science Foundation, $599,999.
18. "Innovation Ecosystem for Higher Education," with D. Janes (PI) and E. D. Hirleman, 1/1/16-6/30/16, Sapiencia (Higher Education Agency of Antioquia), Medellin, Colombia, prime sponsor, Ruta N, Medellin, Colombia, and various universities, $500,144.
19. "Dr. Reddy's Laboratories-Purdue Doctoral Fellows Program," E.D. Hirleman (PI), 1/1/17-12/31/21, Dr. Reddy's Laboratories, Hyderabad, India, $207,939.
20. "Dr. Reddy's Laboratories-Purdue Doctoral Fellows Program," E.D. Hirleman (PI), 1/1/17-12/31/21, Dr. Reddy's Laboratories, Hyderabad, India, $192,469.
21. "Infosys-Purdue Cybersecurity Education Program", S. Garimella (PI). E.D. Hirleman, 10/18/18-10/17/20, Infosys Technologies Ltd., Bangalore, India, $2,051,728.
22. "Dr. Reddy's Laboratories-Purdue Doctoral Fellows Program," E.D. Hirleman (PI), 8/1/18-7/31/23, Dr. Reddy's Laboratories, Hyderabad, India, $192,469.
23. "Rolls-Royce-Purdue Cyber-readiness Partnership," E.D. Hirleman (PI), with 4 others, 06/01/2019-12/31/2020, Rolls-Royce Corp., $1,225,142.
24. REACH (Research, Education and Advocacy for Community Health)," S. Alzyoud (PI, Hashemite University, Amman, Jordan), E.D. Hirleman, and 2 others, 7/1201-6/30/2022, U.S. Dept. of State, part of the Ambassador Christopher Stevens Initiative, $200,000.

Research (PI unless otherwise noted)

25. "*In Situ* Methods for Aerosol Characterization in Combustion Environments," National Science Foundation Research Initiation Grant, 4/78-3/80, $25,000.
26. "Laser Combustion Diagnostics Equipment," National Science Foundation Specialized Research Equipment Grant, 7/78-1/80, $19,280.
27. "Aqueous Foam for Blast Wave Attenuation," with D. L. Evans and D. J. Jankowski, U.S. Navy, 8/78-10/78, $7,221.
28. "Size and Velocity Distributions of Particles and Droplets in Spray Combustion Systems," Project SQUID, Office of Naval Research, 3/79-3/81, $86,000.
29. "Support for Projects on Laser Measurement Techniques in Fluid Mechanics and Combustion," Garrett Turbine Engine Co., 1/80-1/81, $9,000.
30. "Laser Measurement Techniques in Fluid Mechanics and Combustion," Phelps Dodge Corporation, 6/80-8/81, $13,500.

31. "Particle Size and Velocity Measurements in Supersonic Jets," U.S. Naval Center, Dahlgren, VA, 10/80-3/82, $12,198.
32. "Microprocessors in Laser Diagnostics," ASU Faculty Grant-in-Aid, 1/81-1/82, $3,000.
33. "Size and Velocity Distribution of Particles and Droplets in Spray Combustion Systems," Project SQUID, Office of Naval Research, 3/81-3/84, $113,114.
34. "Particle Sizing in Rocket Motor Exhausts," Talley Industries, 9/81-9/82, $5,500.
35. "Laser Diffraction Droplet Sizing Methods," Garrett Turbine Engine Co., 6/83-6/84, $19,000.
36. "Pulverized Coal Combustion Research: Particle Size Effects on Pollutant Formation," with R. Peck, Electric Power Research Laboratory, 6/84-6/85, $15,000; 6/85-6/86, $17,000.
37. "Surface Defect Characterization Using Laser Light Scattering," Digital Equipment Corporation, 7/84-1/85, $35,145; 6/85-1/86, $20,000.
38. "Aspects of Laser Diffraction Particle Sizing Techniques of Relevance to Autonomous, Self-diagnosing Instrumentation," U.S. Air Force Office of Scientific Research, 9/84-9/87, $278,285.
39. "Multiple Scattering in Fraunhofer Diffraction Particle Size Analysis," U.S. Air Force Office of Scientific Research, 9/87-9/89, $185,000; 10/90-9/91, $30,000.
40. "Spray Combustion in Complex Flows," with R. Peck, Garrett Turbine Engine Co., 1/88-12/88, $5,000; 1/89-12/91, $249,522.
41. "Light Scattering by Rayleigh Spheres on Surfaces," 9/89-6/90, IBM Corp., $12,500.
42. "Light Scattering by Particles on Surfaces," Semiconductor Research Corp., 9/89-2/91, $37,500; 9/91-9/92, $100,000; 9/92-9/93, $90,000; 9/93-9/94, $80,000.
43. "Quantitative Spray Diagnostics using Particle Image Velocimetry," with R. E. Peck, Allied-Signal Corp., 9/91-9/92, $10,000.
44. "Pressure Effects on Atomization in Gas Turbine Combustion," with R. E. Peck, Allied-Signal Corp., 9/92-9/93, $24,000.
45. "Surface Roughness Effects on Light Scattering by Particles on Surfaces," SEMATECH, 1/94-7/94, $60,000; 8/94-12/94, $85,000.
46. "Light Scattering by Particles on Patterned Wafers," Semiconductor Research Corp., 9/94-9/95, $100,000; 9/95-9/96, $100,000.
47. "Particle and Defect Metrology," SEMATECH, 1/95-12/95, $150,000.
48. "Detection of Surface Nanoparticles: Wafer Inspection Beyond the 0.1 um Generation," Semiconductor Research Corp., 9/96-10/97, $125,000.
49. "Equipment for Detection of Surface Nanoparticles," Semiconductor Res. Corp., 9/96-8/97, $35,000.
50. "Consortium for Metrology of Semiconductor Nanodefects," multiple sponsors over six years totaling $2.2M: ADE Optical Systems, Inc., $86,000; Applied Materials, Inc., $300,000; Applied Micro-Devices, Inc., $105,000; Duke Scientific Corp, $120,000; Hamamatsu Photonics/Inspex Inc., $200,000; Intel Inc., $200,000; KLA Instruments, Inc., $150,000; Lawrence Livermore National Labs, $80,000; Optical Specialties, Inc., $150,000; SEMATECH, $300,000; Sumitomo, Inc., $300,000; Tencor Instruments, Inc., $150,000; VLSI Standards, Inc., $60,000.
51. "Inspecting High-aspect Ratio Vias using Light Scattering," SEMATECH, 7/97-6/98, $33,000.
52. "Light Scattering by Nanoparticles on Semiconductor Surfaces," grant for time on Beamline 6.3.2 at LBL Advanced Light Source, Lawrence Berkeley Laboratories, 1/98-12/98.
53. "Wafer Inspection Beyond the 0.1 um Generation, Light Scattering by Particles on Surfaces at Extreme Ultraviolet Wavelengths, "Semiconductor Research Corp., 11/98-10/99, $100,000.
54. "Hybrid-emission Ultraviolet Defect Inspection," Semiconductor. Res. Corp, 11/99-10/02, $300,000.

55. “Light Scattering Sensory Method for Rapid Assessment of Foodborne Bacterial Contaminants,” with B. Nebeker and A. Bhunia, U. S. Department of Agriculture, 7/00-6/03, $187,598.
56. “Bio-Optical Compact Disc for Biological Sensing: Modeling,” with B. Nebeker, Crane Naval Surface Weapons Lab, U. S. Navy, 1/01-8/03, $140,000.
57. “Light Scattering by Particles and Processing Defects in Trench and Line Structures: The Defect-to-Process Variation Continuum,” with R. Diaz, International SEMATECH, 8/00- 7/01, $50,000.
58. “Haptic Texture Perception and Rendering for Personal Robotics,” with H. Tan (PI), D. Ebert, A. Maciejewski, and J. Pizlo, National Science Foundation, 8/1/01 – 7/31/04, $311,101.
59. “Optical forward scattering for bacterial colony differentiation and identification,” with A. K. Bhunia (PI), and J. P. Robinson, U. S. Department of Agriculture, 7/05-6/07, $174,605.
60. “Center of Excellence for Airliner Cabin Environment Research,” with Y. Chen (PI), Federal Aviation Administration, 1/05-12/07, $1,256,189.
61. “Bacteria Rapid Detection using Optical Light Scattering (BARDOT)” with A. K. Bhunia (PI), and J.P. Robinson, U. S. Dept. of Ag., 2/07-1/08, $249,884; 2/07-1/08, $100,000; 6/09-5/10, $114,003.
62. “BARDOT Technology Insertion” with A. K. Bhunia (PI), and J. P. Robinson, 4/09-10/09, U. S. Department of Agriculture, $100,000.
63. “A Center for High Performance Buildings,” with J. Braun (PI), E. D. Hirleman and 3 others, National Institute of Standards and Technology, 4/1/10–3/31/13, $11,750,000.
64. “UC Merced Blum Center for Developing Economies” with M. Aldenderfer, 7/1/13–6/30/15, $400,000.
65. “Community-Based Air Pollution Informatics,” with S. Newsam (PI) and S. Ramirez, Development Innovation Laboratory, USAID, 7/1/13–6/30/15, $40,000.
66. “Indiana Digital Crossroads: 2020 Pilot,” E.D. Hirleman (PI) and Mark Ward, 5/1/20-5/15/21, Cummins Engine Co., $500,000.
67. “Collaboration in Education and Research”, E.D. Hirleman (PI), 7/1/2020-6/30/2026, American University of the Middle East, $10,000,000.
68. “Indiana Digital Crossroads: Engine Performance Simulation,” Greg Shaver (PI) and E.D. Hirleman, 8/15/20-8/14/20225/15/21, Cummins Engine Co., $143,,000.
69. “Indiana Digital Crossroads: Prognostics and Diagnostics,” E.D. Hirleman (PI) and Mark Ward, 1/1/22-12/31/2, Cummins Engine Co., $500,000.