

Curriculum Vitae
James S. Harris
James and Ellenor Chesebrough Professor Emeritus of
Electrical Engineering, Applied Physics and Materials Science

Address:

James S. Harris
Department of Electrical Engineering
Paul G. Allen Center for Integrated Systems, Rm. 328
Stanford, CA 94305-4075
Professor of Electrical Engineering, Applied Physics and Materials Science
Voice (650) 723-9775
Fax (650) 723-4659
E-mail jharris@stanford.edu
WWW <http://ee.stanford.edu/~harris>

Degrees:

Ph.D. Stanford University, 1969
M.S. Stanford University, 1965
B.S. Stanford University, 1964 (with Great Distinction and Phi Beta Kappa)

Academic Experience:

1982-present - James and Ellenor Chesebrough Professor (Emeritus 2020) of Electrical Engineering and by courtesy, Applied Physics and Materials Science, Stanford University - Research on molecular beam epitaxy, nanofabrication technologies, micromachining, high speed electronic devices, optoelectronic devices, quantum transport and quantum computation. Built up laboratory with five MBE systems, complete III-V processing and high-speed electronics and optoelectronics testing laboratory with 15 Ph.D. students, post docs and visitors.

1984-1998 Director, Solid State Laboratory, Stanford University - Responsible for management, appointments and promotions in Solid State Electronics Laboratory with eight faculty members and ~100 students.

1985-1999 Director, Joint Services Electronics Program - Responsible for coordinating electronics program with 12 faculty and 12-15 graduate students and post docs which is jointly sponsored by Army, Navy and Air Force.

1992-2016 Principal Investigator Stanford US-Asia Technology Management Center - Responsible for management and appointments for Center program with 4 staff and 8 students studying Asian technology management issues.

Industrial Experience:

2008-2015 Co-founder Solar Junction – Put together team of former students and experienced entrepreneur management team, raised initial venture capital seed round funding and license of Stanford patent on small bandgap solar cell material. Contributed to concentrator solar cell design, materials growth and testing. Solar Junction now holds the world record for monolithic multi-junction solar cell conversion efficiency (44.5% at 750 SUNS).

1980-1982 Director Optoelectronics Research, Rockwell International - Responsible for direction and management of a technical department of 50 people in areas including: Optical sources and detectors for fiber optical systems, integrated opto-electronics, GaAs charge coupled devices, solar cells, electroluminescent displays and ferroelectric and surface acoustic wave devices. Directed successful transfer of long wavelength laser technology to Rockwell Long Distance Telecommunications operating division.

1978-1980 Principal Scientist, Rockwell International - Responsible for technical leadership in department and initiating new technical efforts. Senior corporate advisor for planning and evaluating all technical programs in III-V semiconductor devices. Primary individual focus on application of MBE and MO-CVD to new heterostructure devices and bulk crystal growth of GaAs. Initiated research on heterojunction bipolar transistors (HBT) which became a major Rockwell product for Qualcomm cellular telephones and eventually led to spin-off of Conexant (Skyworks). Led first experimental demonstration of 3" Czochralski bulk growth of GaAs that dramatically changed GaAs technology to switch from irregularly shaped pieces of GaAs to round "Si-like" wafers that enabled use of existing Si lithography and processing tools.

1972-1978 Manager Infrared Devices, Rockwell International - Responsible for leadership and technical direction of 15 technical people in development of III-V Compound Semiconductor Electro-Optical Devices. Rockwell group became one of the leaders in III-V devices and included development of liquid phase epitaxy for long wavelength lasers, initiation of molecular beam epitaxial growth, development of high speed lasers and avalanche photodiodes, light emitting diodes, field assisted photo cathodes, solar cells and high speed charge coupled devices. Demonstrated the first GaAs/Ge dual junction and graded bandgap solar cells that were the foundation for multi-junction solar cells that provide power for all satellites. Developed the highest efficiency GaAs concentrator solar cells and served as the Principal Investigator for delivery of a 20kW GaAs concentrator solar array to Sandia Labs for the Department of Energy.

1969-1972 Member of Technical Staff, Rockwell International – Responsible for development of liquid phase epitaxy and ion implantation in III-V compound materials and development of new devices. Developed first successful n-type implantation for GaAs, first ion implanted MESFETs in semi-insulating GaAs and implant integration technology.

Consulting Experience:

Varian Associates, Avantek-HP, Intel, Vitesse Semiconductor, Panasonic, CBL, Sequoia Capital, U.S. Venture Partners, Novalux, Picarro, General Electric, Wecktech, Litton Systems, Raychem, Picogiga, Norton, Citicorp, ADAPS Photonics, Vertilite, AvicenaTech

Expert Witness and Litigation:

U. S. Department of Justice, Morrison & Foerster, Berg, Ziegler, Anderson & Parker, Nortel, The Round Table Group, Hale & Dorr, Womble, Carlyle, Sandridge & Rice, Quinn Emanuel Urquhart & Sullivan, Jeffer, Mangels, Butler & Mitchell

Scientific Advisory Boards and Board of Directors:

Scientific Advisory Boards of Novalux, Cree, OEpic OptiComp, Lytek, Zia Laser, Solarex, Sigmagen, Vertilite, AvicenaTech

Board of Directors Focaltron, EiC Corporation, OEpic, Solar Junction & ADAPS Photonics.

Awards and Honors:

James and Ellenor Chesebrough Professor in the School of Engineering, Stanford University

IEEE Jun-ichi Nishizawa Medal, 2023

National Academy of Engineering, 2011

International MBE Conference, AI Cho MBE Award, 2014

SRC Aristotle Award, 2013

Fellow Materials Research Society, 2009

International MBE Conference, MBE Innovator Award, 2008

Fellow Optical Society of America, 2005

IEEE Morris N. Liebmann Memorial Award, 2000

IEEE Third Millennium Medal, 2000

International Symposium on Compound Semiconductors Award and Heinrich Welker Medal, 2000

Visiting Professor, Paul Drude Institute, Berlin, Germany, 1999

Alexander von Humboldt Foundation Senior Research Prize, 1998

Visiting Professor and Research Fellow, Kochi University of Technology, Japan, 1998-2005

Best Paper Award, Solid State Devices and Materials Conference, Yokohama, Japan, 1996

Stanford Associates Alumni Award, 1994

Fellow, American Physical Society, 1992

Visiting Professor, Ecole Polytechnique Federale de Lausanne, Switzerland, 1992

Fellow, IEEE, 1988

Best Student Paper Awards, Electronics Materials Conference, 1993, 1997, 2001, 2003, 2004, 2006

Best Student Paper Awards, North American MBE Conference, 2001, 2003, 2004, 2006, 2012

Best Student Paper Awards, Materials Research Society Conference, 2003, 2004, 2005, 2007

Electronic Materials Symposium Outstanding Student Award, 1988, 1990, 1993, 1997, 2000, 2001, 2003, 2004, 2005, 2008, 2011, 2012, 2014

United Nations Visiting Professor, State University Sao Paulo, Campiñas, Brazil, 1978.

Tektronix Fellowship, Stanford University, 1965-66.

Terman Engineering Award, Stanford University, 1964.

Phi Beta Kappa, 1964

Tau Beta Pi, 1963

Professional Societies and Activities:

Chair, Section 7, NAE 2019-2021

Vice Chair, Section 7, NAE 2017-2019

Presidential Search Committee, NAE 2016-2017

Peer Review Committee, Section 7, NAE 2014-2017

Associate Editor, IEEE Journal of Lightwave Technology 2001-2008

Divisional Editor, Journal of the Electrochemical Society 1976-1988

Organizing Committee, International GaAs and Related Compounds Conference 1976-present

Editorial Board, Solar Cells: Their Science, Technology, Applications and Economics 1979-87
Member, AdComm, IEEE-Electron Device Society 1980-1996
National Research Council Consultant 1980, 1985, 1987, 1988, 1990, 1992, 2000-2004
Chairman, Technical Committee on Optoelectronic Devices, IEEE Electron Society 1980-82
Chairman, Technical Committee on Materials-IEEE Electron Device Society 1982-1996
Organizing Committee, International & US Molecular Beam Epitaxy Conference 1982-present
Chairman, International Molecular Beam Epitaxy Conference Advisory Committee, 1998-2004
Program Committee Chairman, 1987 Molecular Beam Epitaxy Workshop
Program Committee Chairman 1988 International GaAs and Related Compounds Conference
Conference Chairman 1993 Molecular Beam Epitaxy Workshop
Conference Chairman 2002 International Molecular Beam Epitaxy Conference
Program Committee Proceeding Editor, 1990 International Molecular Beam Epitaxy Conference
Program Committee IEDM, 1980-83, 2003-05
National Research Council Committee - Photovoltaic Devices for SPS, 1980-81; Challenges in
Compound Semiconductor Processing, 1987-88, Research Associates Program. 2000-04
Fellow, IEEE, American Physical Society, Optical Society of America, Materials Research Society
Member, Electrochemical Society, American Vacuum Society, Materials Research Society
Elected Member, Phi Beta Kappa, Tau Beta Pi and Sigma Xi

Current Research Interests

Research interests are in the areas of new electronic and optoelectronic device structures created by heterojunctions, quantum wells, superlattices and nanostructured materials. Molecular Beam Epitaxy (MBE) is utilized to prepare nanostructured structured metastable materials with atomic layer control and dimensions smaller than the wavelength of electrons. In this regime, quantum size effects can be utilized to create entirely new device structures based upon tunneling and/or transitions between quantum states. Current activities include: MBE growth of novel optoelectronic materials (GaInNAsSb) for long wavelength lasers and solar cells; quantum well structures for surface emitting lasers, high-power lasers, high speed optical modulators and non-linear optical effects for generation, control and application of ultra-short optical pulses; ultra-high efficiency multi-bandgap solar cells; world record solar to hydrogen conversion with water splitting; Si based photonic devices, including single photon avalanche detector (SPAD) for range finding and autonomous vehicles and implantable retina prosthesis with first human response in phase 1 human trials, 12/17; integrated photonic systems for biomedical detection and applications; integrated nanophotonic structures for laser driven dielectric electron accelerators and free electron lasers (FEL) on a wafer.

Ph.D. Supervision:

Principal dissertation supervisor for 140 Ph.D. Students, 1982-present
Supervised 25 postdoctoral scholars and visiting scientists

Publications, Presentations and Patents

Over 1150 publications (>50,000 citations, h-index = 111) in refereed scientific journals, 14 book chapters, editor of 3 books, holder of 31 issued US patents and over 900 presentations at technical meetings.