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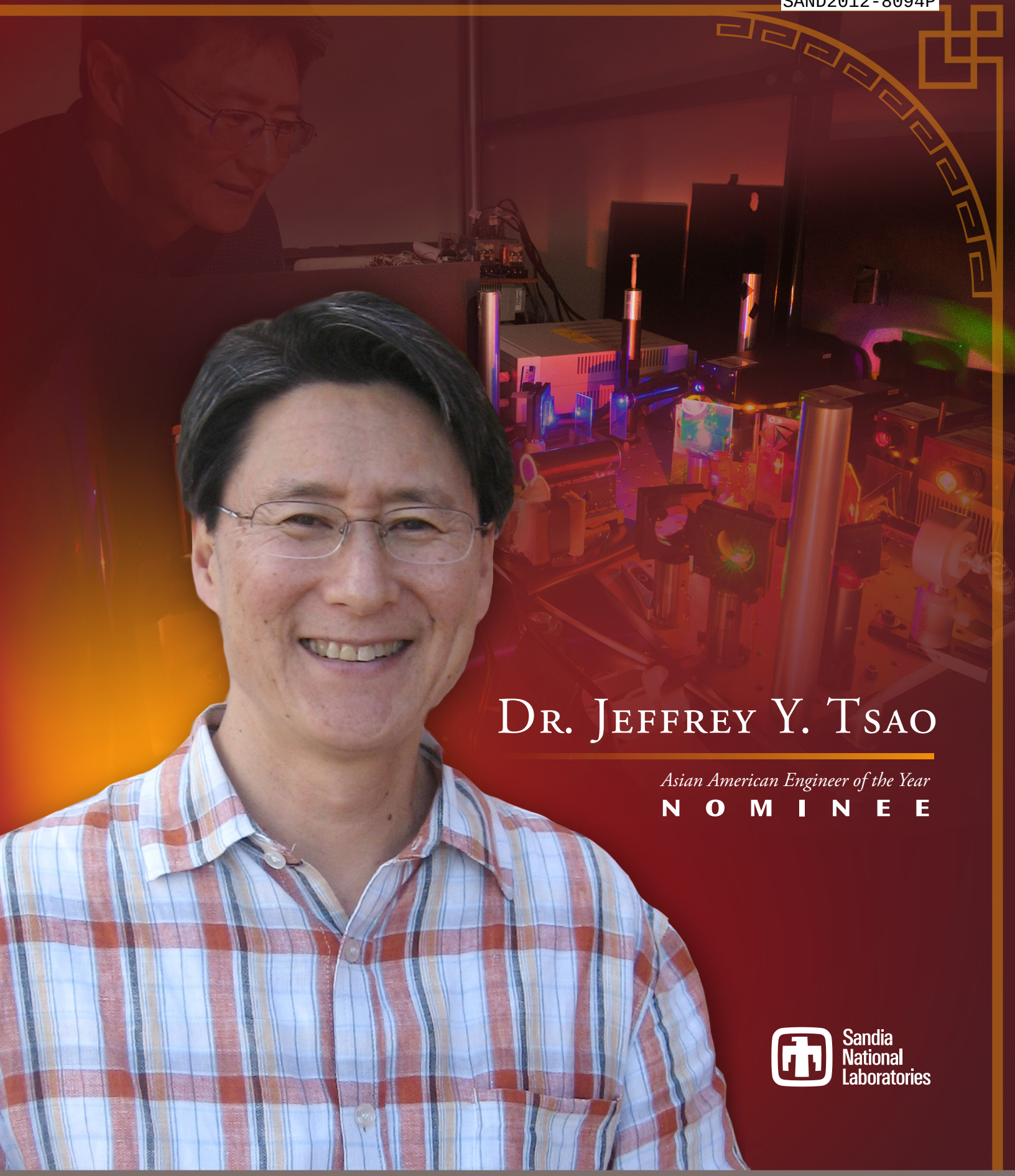


Dr. Jeffrey Y. Tsao

Asian American Engineer of the Year

NOMINEE

Sandia National Laboratories

Nomination Form

2013 AAEOY Award Nomination Form

Please complete one Nomination Form per nominee.

Nominee's name:
Jeffrey Y. Tsao Title/Position: Distinguished Member Technical Staff

Award Category:

☐ *Asian American Executive of the Year*

☒ *Asian American Engineer of the Year*

☐ *Asian American Most Promising Engineer of the Year*

Citation of Accomplishment (See Instruction and example on the next page):
Sustained contributions to compound semiconductor materials and device science, and exemplary contributions to solid-state lighting technology.

Company name:
Sandia National Laboratories

Company address:
1515 Eubank, SE, Albuquerque, NM 87185

Contact phone no. 505-844-7092 FAX no. 505-844-4045 E-mail jytsao@sandia.gov

Nominee's mailing address: PO Box 5800, Sandia National Labs, Albuquerque, NM 87185-1421

Nominator's name:
Dr. Paul J. Hommert Title/Position: President and Laboratories Director

Company name:
Sandia National Laboratories

Company address:
1515 Eubank, SE, Albuquerque, NM 87185

Contact phone no. 505-844-7261 FAX no. 505-844-1120 E-mail pjhomme@sandia.gov

Nominator's mailing address: PO Box 5800, Sandia National Labs, Albuquerque, NM 87185-0101

The Nominator certifies that, to the best of his (her) knowledge, all information about the Nominee included in the Nomination Package (see instruction on the next page) is accurate and verifiable. Please include a scanned signed copy of this form in the Nomination Package to be submitted via e-mail to **nomination@aaeoy.org** by **September 30, 2012.**

Nominator's signature _____, Date __9/29/2012__

Biographical Profile

Dr. Jeffrey Y. Tsao grew up in Los Angeles, CA. He is a graduate of Stanford University (AB in Mathematics, MS in Electrical Engineering) and Harvard University (MS, PhD in Applied Physics). He is married and has two children. Both his parents immigrated to the U.S. during the Chinese Civil War in the late 1940's, and are naturalized citizens.

Currently a Distinguished Member of Technical Staff at Sandia National Laboratories (Sandia), and Chief Scientist of its Energy Frontier Research Center (EFRC) for Solid-State-Lighting Science, his career to-date includes three phases, each lasting about a decade.

From 1981 to 1991, Dr. Tsao was a research staff member, first at MIT-Lincoln Laboratory then at Sandia. During this phase, his focus was on research: of the 112 journal articles he has published, 98 stem from work during this phase, as does his research monograph, "Materials Fundamentals of Molecular Beam Epitaxy."

From 1991 to 2001, he was a research manager; first at three closely related departments at Sandia, and then, while on entrepreneurial leave, as Vice President of R&D at E2O Communications, a U.S.-based, pre-IPO, fiber communications components company. During this stage of his career, Dr. Tsao built world-class teams and programs in the area of "smart" compound semiconductor epitaxy and devices for high-speed communications.

From 2001 to the present (2012), he returned to Sandia as a researcher. In this period, his focus was broader, working on white papers and reports to influence larger national and global research directions. Dr. Tsao helped the DOE Office of Science and DOE Office of Energy Efficiency and Renewable Energy (EERE) coordinate workshops and roadmaps in various areas of energy science and technology. He was an early pioneer in solid-state lighting (SSL), a technology poised to transform how the world consumes 20% of its electricity. Along the way, he has outlined new and counterintuitive ways of thinking about the energy economics of lighting.

http://www.sandia.gov/~jytsao/

Cover of journal containing a 2011 article that Jeff co-authored reprising a now-famous 1999 white paper which first made "the case" for solid-state lighting.

Qualification and Requirements

Addresses

Work:
Sandia National Laboratories,
Albuquerque NM 87185-1421,
(505) 844-7092, jytsao@sandia.gov

Home:
12513 Crested Moss Road, ABQ NM 87122,
(505) 480-4267 (mobile)

Personal

Born May 1955 in Los Angeles, CA.
Married, two children.
U.S. citizen with DOE Q-clearance.
Father: Ching H. Tsao, born November 1920, Shanghai, China, now a naturalized U.S. citizen. Mother: Matilda M. Tsao, born October 1928, Guangdong, China, now a naturalized U.S. citizen.

Education

Harvard University (1977–1981)

PhD in Applied Physics under Professor N. Bloembergen (IR Multiphoton Pumping of Electronically Excited Molecules)
MS in Applied Physics (Major Fields: Quantum Electronics, Solid-State Physics, Materials Science)

Stanford University (1973–1977)

MS in Electrical Engineering
BS in Mathematics

Ching Hua Tsao and Matilda Chien-Ling Ma in Chicago in 1952, just after they were married.

Jeff and his wife Sylvia in 1981 after Jeff's graduation from Harvard.

Professional Achievements

Current Employment

2011–: Distinguished Member of Technical Staff, Sandia National Laboratories. Involved in diverse research activities, including energy science, technology and economics; complex adaptive systems; and the "science" of science.

2009 –: Chief Scientist, Energy Frontier Research Center for Solid-State Lighting Science. Provides scientific leadership and vision for this $18M/5-year DOE Office of Science project involving more than 20 Sandia staff and external partners.

Previous Employment

2005–2007: Part-Time Detailee, DOE Office of Basic Energy Sciences (BES). Coordinated two major workshops, one on solar energy utilization and one on solid-state lighting. The process Dr. Tsao helped put in place for the first workshop established the principles for subsequent Basic Research Needs workshops (ten all together), which in turn lay the foundation for the creation of DOE's 46 EFRCs, with anticipated funding of $777M during 2009–2014.

2001–2010: Principal Member of Technical Staff, Sandia National Laboratories. Led research and roadmapping activities involving integrated science, technology, and economic modeling in solid-state lighting and other areas. Dr. Tsao also explored network models of knowledge production—a new approach to the field of "evolutionary epistemology."

2000–2001: Vice President, Research & Development, E2O Communications, a U.S.-based, pre-IPO fiber communications components company. Built and led an R&D team to develop long-wavelength vertical-cavity surface-emitting laser (VCSEL) technology for uncooled 1–10 Gbps short- and intermediate-reach applications.

1998–1999: Visiting Lecturer, Institute of Materials Research and Engineering, Singapore. Delivered a series of twelve lectures on compound semiconductor epitaxy that surveyed the entire field from science and technology to applications.

Jeff sitting with the university and industry students who took his course at the Institute of Materials Research and Engineering in Singapore in 1998.

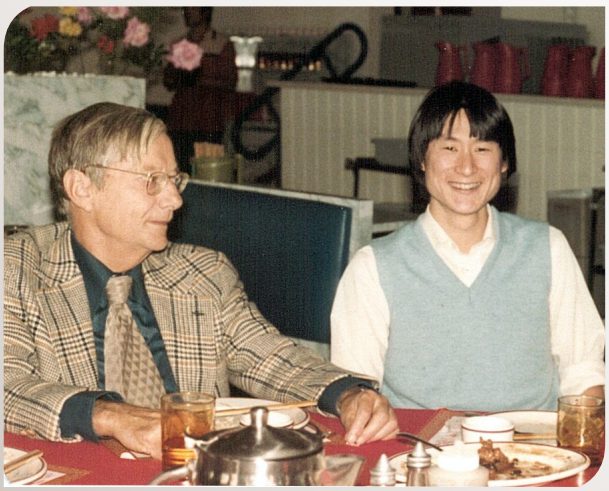
1991–2000: Manager, Semiconductor Materials/Process Departments 1144 / 1311 / 1126, Sandia National Laboratories. Championed new science-based approaches to epitaxial growth (e.g., in situ monitoring and process modeling/control), and catalyzed and oversaw many of Sandia's technology partnerships in compound semiconductor materials. Dr. Tsao had the privilege of hiring and mentoring a series of world-

class "growers," all of whom have gone on to outstanding careers as entrepreneurs, scientists, professors, or technologists.
1983-1991: Member of Technical Staff, Sandia National Laboratories. Participated in research activities aimed at unraveling fundamental aspects of ultrafast (laser quenched) and ultraslow (molecular beam epitaxy) crystal growth.

1981-1983: Member of Technical Staff, MIT-Lincoln Laboratory. Participated in research activities developing "laser microchemical" techniques for direct-write modification of surfaces for microelectronics technologies.

1980-1981: Consultant, Tachisto Lasers, Inc. Consulted on CO_2 laser designs.

1978-1981:Research Assistant and Teaching Fellow, Harvard University. Conducted PhD research, and was teaching assistant to undergraduate electronics laboratories.



Jeff with his Harvard PhD advisor, Nico Bloembergen (Nico won the 1981 Nobel Prize in Physics).

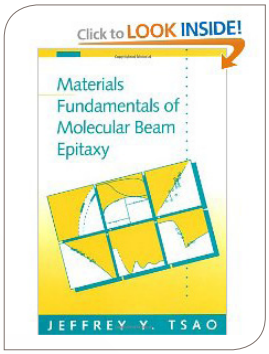
Prominent Engineering or Engineering-Related Projects

2001-2012: Solid-State Lighting (Research)
During 2001-2012, Dr. Tsao returned to research and began work in the area of SSL. He partnered with colleagues at Hewlett-Packard to co-author a seminal and globally influential white paper outlining the enormous energy-efficiency potential of SSL. The white paper catalyzed national R&D programs in the U.S. and abroad. He subsequently served as editor of DOE EERE's first comprehensive SSL technology roadmap, and of DOE BES' Basic Research Needs for Solid-State Lighting workshop report. Dr. Tsao is a deep and visionary thinker in the area of solid-state lighting, is regularly invited to give talks, and in the past three years has given five conference keynote speeches. He was one of the principal architects of Sandia's EFRC for Solid-State Lighting Science, for which he currently serves as Chief Scientist. Recently, Dr. Tsao has turned his attention to the energy economics of lighting, and a recent series of three high-profile papers has led to prominent media coverage (e.g., the *Economist*, National Public Radio, and *The New York Times*).

2000-2001: Long-Wavelength VCSELs (Line Management and Entrepreneurship)
Dr. Tsao served as Vice President of R&D at E2O Communications, Inc., a U.S.-based, pre-IPO fiber communications components company in 2000–2001. He built and led an R&D team to develop long-wavelength VCSEL technology for uncooled 1–10 Gbps short- and intermediate-reach applications. E2O and its technology were acquired by JDS Uniphase in 2004.

1991-2001: Science-Based Semiconductor Epitaxy (Line and Program Management) From 1991 to 2001, Dr. Tsao managed various semiconductor materials research departments at Sandia. The common theme of these departments was his vision of "science-based semiconductor epitaxy," in which emerging scientific understanding of the fundamental thin-film, surface and gas-phase processes associated with epitaxy was harnessed to improve epitaxy technology and ultimately the advanced devices such epitaxy enables. Among the achievements of his and collaborating departments during this period were the first application of metal-organic chemical vapor deposition and real-time optical monitoring tools to fabrication of ultracomplex heterostructures, such as VCSELs, followed a few years later by Sandia's achievement of world-record-performing VCSELs. Sandia won much international recognition for this work, including an R&D 100 Award, and spawned a successful spin-off company, MODE, that was acquired by EMCORE Corporation. Moreover, many of the young staff he recruited and mentored during this period have gone on to make very significant accomplishments in their own right (e.g., CEO of EMCORE Corporation; Chair of EE Department at Yale University; VP of Photonic Integrated Circuit (PIC) Products, Infinera; Co-Founder and Executive VP, Tria Beauty; Co-Founder and President, MODE). Dr. Tsao also developed many industrial partnerships during this period, including a highly successful $10.5M partnership with Hewlett-Packard, programs with Motorola totaling ~$8M, and a $1M partnership with EMCORE.

1984-1991: Fundamentals of Semiconductor Epitaxy (Research) During 1984-1991, Dr. Tsao and his colleagues engaged in detailed studies of the science of semiconductor epitaxy, including ultra-fast liquid-phase epitaxy via laser quenching; the stability and metastability of strained epitaxial films; and the interaction between chemistry and morphology during III-V molecular beam epitaxy. This period of work led to a series of papers that, in the area of strained epitaxial films alone, has accumulated 975 citations (indexed by the ISI Web of Science as of August, 2012), and to a 1993 research monograph, "Materials Fundamentals of Molecular Beam Epitaxy," for which he won Martin-Marietta's Jefferson Cup and Author of the Year corporate awards in 1994. The concept of "excess stress" developed by Dr. Tsao and his colleagues is now the standard way of understanding stability and metastability of the strained-semiconductor heterostructures now used widely in high-performance devices.



1984-1991: Fundamentals of Semiconductor Epitaxy (Research)

1981-1984: Laser Microchemistry (Research) As a young staff member at MIT-Lincoln Laboratory from 1981-1984, Dr. Tsao contributed to the then-new field of laser microchemistry, in which thermal and photochemical processes are used for submicron direct-write deposition on, and etching of, semiconductor thin films. The group at MIT-Lincoln Laboratory became widely known in this area, publishing a

series of papers that has accumulated 788 citations (indexed by the ISI Web of Science as of August, 2012).

Service to professional societies and committees

Dr. Tsao serves or served on a number of science or technical advisory boards, including three DOE-sponsored EFRC, the NSF Smart Lighting Center at Rensselaer Polytechnic Institute (RPI), and Strategies in Light, the world's largest SSL conference and trade show. He has also contributed to numerous government panels and roundtables on behalf of the DOE Office of Science and EERE, and coordinated on their behalf three workshops, one on solar energy and two on solid-state lighting.

Dr. Tsao has diverse interests and is a member of nine professional societies and Fellow of two (the American Association for the Advancement of Science and the American Physical Society). Over the years, he has chaired or co-chaired or served on program committees for numerous symposia. His favorite committee was the Materials Research Society (MRS) Graduate Student Awards Committee, which he chaired for three years (1998–2000), and his largest conference responsibility was the Spring 1995 MRS Meeting (2,500 attendees), which he co-chaired.

Professional Awards, Accomplishments and Experience:

2010–	Science Advisory Boards: RPI's Smart Lighting Energy Research Center; University of Michigan's Solar/Thermal Energy Conversion EFRC; University of California Santa Barbara's Center for Energy Efficiency Materials EFRC; University of Southern California's Center for Energy Nanoscience EFRC; Strategies in Light Advisory Panel
2010–2011	Technical Advisory Board: Inari (Malaysia)
2009	Technical Advisory Board: Industrial Technology Research Institute (Taiwan)
2008–	Invited Contributor: DOE-EERE annual SSL roundtables
2006	Honorary Chair, China International Forum on Solid-State Lighting
2005–2007	Coordinator, DOE-Office of Science workshops on Basic Research Needs for Solar Energy Utilization and Solid-State Lighting
2002	Coordinated and edited comprehensive update to U.S. Solid-State Lighting Light-Emitting Diode (LED) Roadmap
1999–2001	Member, Tecstar Corporation Science Advisory Board
1998–2000	Chair, MRS Graduate Student Awards Committee
1998	Created and taught comprehensive course on Semiconductor Epitaxy at National University of Singapore
1995	Co-chair, Spring Materials Research Society Meeting (2,500 attendees)
1993	Co-chair, MRS Symposium: Common Themes and Mechanisms of Epitaxial Growth
1992–9	Various technical program committees: MRS, American Vacuum Society (AVS), North American Molecular Beam Epitaxy (NAMBE), Electromagnetic Compatibility (EMC), Optical Society of America (OSA), and International Society of Optics and Photonics (SPIE)
1990	Co-chair, MRS Symposium: Evolution of Thin-Film and Surface Microstructure
1987	Co-chair, SPIE Symposium on Lasers in Microlithography

Professional Societies:

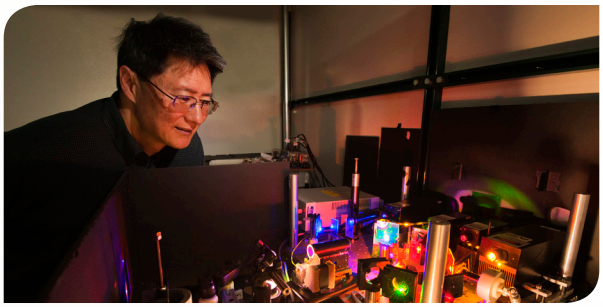
Fellow:	American Association for the Advancement of Science, American Physical Society
Member:	American Economic Association, Human Behavior and Evolution Society, Institute of Electrical and Electronics Engineers, International Association for Energy Economics, Illumination Engineering Society, American Psychological Association, Materials Research Society

Impact of Professional Accomplishments

Dr. Tsao has published 112 journal articles (with collectively over 2,900 Web of Science citations); been granted nine U.S. patents; authored, co-authored, or co-edited five books; and given 90 invited or plenary talks. His H-index is 28. Below is a listing of his ten most-cited journal articles; selected review articles or book chapters; selected authored or edited books; selected reports, white papers, and websites; selected patents; selected plenary and invited presentations; professional awards.

In recognition of the quality and impact of his research, Dr. Tsao was elected Fellow of the American Association for the Advancement of Science (2009) and the American Physical Society (1996). In recognition of the quality and impact of his research in the science of semiconductor epitaxy, as exemplified by his research monograph "Fundamentals of Molecular Beam Epitaxy," he received in 1994 the Sandia and Martin Marietta Author of the Year awards, as well as the Martin Marietta Jefferson Cup award.

Finally, in recognition of the impact of his research and management career on Sandia's mission, particularly his influence on the development of solid-state lighting technology, in 2011 Dr. Tsao was named Distinguished Member of Technical Staff.



Sandia researcher Jeff Tsao examines the set-up used to test diode lasers as an alternative to LED lighting.

Most Cited 10 Journal Articles

1. RELAXATION OF STRAINED-LAYER SEMICONDUCTOR STRUCTURES VIA PLASTIC FLOW, B.W. Dodson, J. Y. Tsao, *Applied Physics Letters* 51, 1325–1327 (1987); and Applied Physics Letters **53**, 1128 (1988). Citations = 417.
2. A REVIEW OF LASER MICROCHEMICAL PROCESSING, D.J. Ehrlich and J.Y. Tsao, *Journal of Vacuum Science and Technology* **B1**, 969 (1983). Citations = 296.
3. CRITICAL STRESSES FOR SixGe1-x STRAINED-LAYER PLASTICITY, J.Y. Tsao, B.W. Dodson, S.T. Picraux, D.M. Cornelison, *Physical Review Letters* **59**, 2455 (1987). Citations = 148.
4. PARTITIONING OF ION-INDUCED SURFACE AND BULK DISPLACEMENTS, D.K. Brice, J.Y. Tsao, S.T. Picraux, *Nuclear Instruments and Methods in Physics Research* **B44**, 68-78 (1989). Citations = 96.

5. EXCESS STRESS AND THE STABILITY OF STRAINED HETEROSTRUCTURES, J.Y. Tsao, B.W. Dodson, *Applied Physics Letters* **53**, 848-850 (1988). Citations = 92.
6. SOLID-STATE LIGHTING: LAMP TARGETS AND IMPLICATIONS FOR THE SEMICONDUCTOR CHIP, J.Y. Tsao, *IEEE Circuits & Devices* Vol 20, No. 3, pp. 28–37 (May/June, 2004). Citations = 91.
7. SOLUTE TRAPPING: COMPARION OF THEORY WITH EXPERIMENT, M.J. Aziz, J.Y. Tsao, M.O. Thompson, P.S. Peercy, C.W. White, *Physical Review Letters* **56**, 2489 (1986). Citations = 87.
8. RESEARCH CHALLENGES TO ULTRA-EFFICIENT INORGANIC SOLID-STATE LIGHTING, J.M. Phillips, M.E. Coltrin, M.H. Crawford, A.J. Fischer, M.R. Krames, R. Mueller-Mach, G.O. Mueller, Y. Ohno, L.E.S. Rohwer, J.A. Simmons, J.Y. Tsao, *Laser and Photonics Reviews* **1**, 307–333 (November, 2007). Citations = 83.
9. LAYER-BY-LAYER SPUTTERING AND EPITAXY OF Si(100), P. Bedrossian, J. E. Houston, J.Y. Tsao, E. Chason, S.T. Picraux, *Physical Review Letters* **67**, 124-127 (1991). Citations = 63.
10. PHOTODEPOSITION OF Ti AND APPLICATION TO DIRECT WRITING OF Ti: LiNbO3 WAVEGUIDES, J.Y. Tsao, R.A. Becker, D.J. Ehrlich, F.J. Leonberger, *Applied Physics Letters* **42**, 559 (1983). Citations = 63.

Selected Review Articles or Book Chapters

1. ULTRA-EFFICIENT SOLID-STATE LIGHTING: LIKELY CHARACTERISTICS, ECONOMIC BENEFITS, TECHNOLOGICAL APPROACHES, J.Y. Tsao, J.J. Wierer, L.E.S. Rohwer, M.E. Coltrin, M.H. Crawford, J.A. Simmons, P.C. Hung, H. Saunders D.S. Sizov, R. Bhat, C.E. Zah, to be published in T-Y Seong, H. Amano, J. Han, and H. Morkoc, Eds., "III-nitride based lighting emitting diodes and applications" (Springer, 2013).
2. SOLID-STATE LIGHTING: AN INTEGRATED HUMAN FACTORS, TECHNOLOGY AND ECONOMIC PERSPECTIVE, J.Y. Tsao, M.E. Coltrin, M.H. Crawford, J.A. Simmons, *Proceedings of the IEEE* **98** (7), 1162-1179 (2010).
3. AlGaAs OMVPE IN A ROTATING-DISK REACTOR: THE ANATOMY OF A VCSEL, W.G. Breiland, M.E. Coltrin, J. R. Creighton, H.Q. Hou, H.K. Moffat and J.Y. Tsao, *Materials Science and Engineering Reports* **R24**, 241 (1999).
4. A REVIEW OF REFLECTION MASS SPECTROMETRY DURING III/V MBE, J.Y. Tsao, *Computational Materials Science* **6**, 140 (1996).
5. STRUCTURAL RELAXATION IN METASTABLE STRAINED-LAYER SEMICONDUCTORS, B.W. Dodson and J.Y. Tsao, *Annual Reviews of Materials Science* **19**, 419-437 (1989).
6. A REVIEW OF LASER MICROCHEMICAL PROCESSING, D.J. Ehrlich and J.Y. Tsao, *The Journal of Vacuum Science and Technology* **B1**, 969 (1983).

Selected Authored or Edited Books

1. FUNDAMENTALS OF MOLECULAR BEAM EPITAXY, J.Y. Tsao (Academic Press, 1993).
2. EVOLUTION OF THIN-FILM AND SURFACE MICROSTRUCTURE, C.V. Thompson, J.Y. Tsao, D. J. Srolvitz, Eds., *Proceedings of the Fall 1990 Materials Research Society Meeting 202*, Boston, MA, 11/26-12/1/90.

3. LASERS IN MICROLITHOGRAPHY, D.J. Ehrlich, J.Y. Tsao and J.S. Batchelder, Eds., Proceedings of SPIE, *The International Society for Optical Engineering*, **774**, Santa Clara, CA, 3/2-3/87.
4. LASER MICROFABRICATION: THIN FILM PROCESSES AND LITHOGRAPHY, D.J. Ehrlich and J.Y. Tsao, Eds. (Academic Press, NY, 1988).
5. VLSI ELECTRONICS: MICROSTRUCTURE SCIENCE, Vol. 7, D.J. Ehrlich and J.Y. Tsao, Academic, New York (1983).

Selected Reports, White Papers and Websites

1. A CASE FOR SANDIA INVESTMENT IN COMPLEX ADAPTIVE SYSTEMS SCIENCE AND TECHNOLOGY, C.M. Johnson, G.A. Backus, T.J. Brown, R. Colbaugh, K.A. Jones, J.Y. Tsao; (May, 2012).
2. A BRIEF HISTORY OF SANDIA NATIONAL LABORATORIES AND THE DEPARTMENT OF ENERGY'S OFFICE OF SCIENCE: INTERPLAY BETWEEN SCIENCE, TECHNOLOGY, AND MISSION; J.Y. Tsao, J.A. Simmons, S.S. Collis, A. McIlroy, S.M. Myers, S.T. Picraux, F.L. Vook; August, 2011.
3. SOLAR FAQS, J.Y. Tsao, N. Lewis and G. Crabtree (report for Office of Basic Energy Sciences, March, 2006).
4. FINAL REPORT ON GRAND CHALLENGE LDRD PROJECT: A REVOLUTION IN LIGHTING – BUILDING THE SCIENCE AND TECHNOLOGY BASE FOR ULTRA-EFFICIENT SOLID-STATE LIGHTING, Simmons, J. A., J. Y. Tsao, S. R. Kurtz, T. M. Bauer, R. J. Kaplar, W. W. Chow, E. D. Jones, K. E. Waldrip, S. R. Lee, A. J. Fischer, M. H. Crawford, K. W. Fullmer, B. L. Abrams, R. M. Biefeld, D. D. Koleske, A. A. Allerman, J. J. Figiel, R. J. Creighton, M. E. Coltrin, K. C. Cross, C. C. Mitchell, T. M. Kerley, G. T. Wang, K. H. A. Bogart, C. H. Seager, J. M. Campbell, D. M. Follstaedt, M. P. Moran, A. K. Norman, A. F. Wright, S. M. Myers, N. A. Missert, R. G. Copeland, J. M. Gee, P. P. Provencio. J. P. Wilcoxon, S. Woessner, G. R. Hadley, J. R. Wendt, R. J. Shul, C. I. H. Ashby, L. E. S. Rohwer, D. R. Tallant, R. L. Simpson, H. K. Moffat, A. G. Salinger, R. P. Pawlowski, J. A. Emerson, S. G. Thoma, P. J. Cole, K. W. Boyack, R. Elliot, M. L. Garcia, A. Salamone, M. Allen, B. A. Burdick, N. M. Rahal, M. A. Monson, R. M. Gonzales, E. T. Southwell, A. E. Miksovic, A. O. Pinson, and M. J. Pinzon; SAND Report 2004-2365 (June, 2004).
5. LIGHT EMITTING DIODES (LEDS) FOR GENERAL ILLUMINATION, J.Y. Tsao, Ed., OIDA Technology Roadmap (Optoelectronics Industry Development Association, October, 2002).
6. SANDIA SOLID-STATE LIGHTING WEBSITE http://lighting.sandia.gov/, D.M. Meister, J.Y. Tsao and A.E. Miksovic (2002).
7. LIGHT FOR THE 21ST CENTURY YEAR 2000 PROJECT REVIEW, translated from Japanese to English by Kirill Sereda and Jeff Tsao (April, 2002).
8. THE CASE FOR A NATIONAL RESEARCH PROGRAM ON SEMICONDUCTOR LIGHTING, R. Haitz, F. Kish, J.Y. Tsao and J.S. Nelson (white paper first presented publicly at the 1999 Optoelectronics Industry Development Association (OIDA) forum in Washington DC on October 6, 1999).

Selected Patents

1. SURFACE ACOUSTIC WAVE DEVICES AND METHOD OF MANUFACTURE THEREOF, V.S. Dolat, D.J. Ehrlich and J.Y. Tsao, U.S. Patent No. 4,672,254, Issued June, 1987.
2. REFLECTION MASS SPECTROMETRY TECHNIQUE FOR MONITORING AND CONTROLLING COMPOSITION DURING MOLECULAR BEAM EPITAXY, J.Y. Tsao, T.M. Brennan and B.E. Hammons, U.S. Patent No. 5,171,399, Issued December 5, 1992.
3. PHOTODETECTOR WITH ABSORBING REGION HAVING RESONANT PERIODIC ABSORPTION BETWEEN REFLECTORS, R.P. Bryan, G.R. Olbright, R.M. Brennan, J.Y. Tsao, U.S. Patent No. 5,389,797, Issued February 14, 1995.
4. SEGMENTED-MIRROR VCSEL, J.Y. Tsao, C.L. Shieh, D. Dapkus, J. Yang, U.S. Patent No. 6,594,294, Issued July 15, 2003.
5. MOLTEN-SALT-BASED GROWTH OF GROUP III NITRIDES, K.E. Waldrip, J.Y. Tsao, T.M. Kerley, U.S. Patent No. 7,435,297, Issued October 14, 2008.

Selected Recent Plenary and Invited Presentations

1. J.Y. Tsao, "The Next Semiconductor Revolution: This Time It's Lighting!," International Energy Agency, Paris, France, June 7, 2007, Paris, France.
2. J.Y. Tsao; "Solid-State Lighting: Science," Technology and Economic Perspectives; Workshop on the Research Frontiers of Solid State Lighting; December 1, 2009; Nanyang Technological University, Singapore; Invited.
3. J.Y. Tsao; "(Lighting) and Solid-State Lighting: Science, Technology and Economic Perspectives;" SPIE Photonics West 2010 OPTO Symposium; January 26, 2010; San Francisco, CA; Plenary.
4. J.Y. Tsao; "Solid-State Lighting: The III-V Epi 'Killer App';" 15th International Conference on Metal Organic Vapor Phase Epitaxy (ICMOVPE-XV); May 24, 2010; Lake Tahoe, CA; Plenary.
5. J.Y. Tsao; "(Lighting) and Solid-State Lighting: Science, Technology and Economic Perspectives;" SPIE Optics+Photonics; August 1, 2010; San Diego, CA; Plenary.
6. J.Y. Tsao, H.D. Saunders, J.R. Creighton, M.E. Coltrin, J.A. Simmons; "Lighting Technologies, Costs, and Energy Demand: Global Developments to 2030;" Research Seminar; September 28, 2010; World Bank, Washington DC; Invited.
7. J.Y. Tsao; "Solid-State Lighting: It's also about Human Productivity;" Corning Stookey Award Ceremony; October 13, 2010; Corning, NY; Keynote.
8. J.Y. Tsao; Solid-State Lighting: It's also about Human Productivity; International Electron Devices and Materials Symposium (IEDMS 2010); November 18, 2010; Chungli, Taiwan; Plenary.
9. J.Y. Tsao, M.E. Coltrin, J.A. Simmons, M.H. Crawford, A. Armstrong, A. J. Fischer, E. A. Shaner, G.T. Wang, J.E. Martin, "Sandia's Energy Frontier Research Center (EFRC) for Solid-State Lighting Science," Sandia National Laboratories Physical, Chemical and Nano Sciences Colloquium, Albuquerque, NM, 13 April 2011; Invited.

10. J.Y. Tsao; "Perspectives on Ultra-Efficient Solid-State Lighting: Characteristics, Economics, Approaches;" Nobel Symposium on Nanoscale Energy Converters; August 12–16, 2012; Örenäs Castle, Sweden; Invited.

Jeff giving a lecture in 2010 at the Albuquerque Academy, a local grades 6-12 private school.

Professional Awards

2012	Sandia National Laboratories Entrepreneurial Spirit Award
2011	Distinguished Member of Technical Staff, Sandia National Laboratories
2009	Fellow, American Association for the Advancement of Science
2007–08	Sandia National Labs Employee Recognition Awards: Individual Technical Excellence (2007); Team (2008)
1996	Fellow, American Physical Society
1994	Sandia and Martin Marietta Author of Year and Martin Marietta Jefferson Cup Award

Community Service

Dr. Tsao is a steady volunteer at local schools and community organizations. Among his more recent and enjoyable activities, he volunteered at the local hands-on Explora science museum, helping develop an exhibit that has been used not just at the Explora but subsequently at other venues. More behind the scenes, he has over the years helped coordinate nomination packages or draft recommendation letters for numerous awards and prizes (18 colleagues) and permanent residency or citizenship applications (five colleagues). Most recently, for two months this summer (2012), Dr. Tsao mentored four high school students with interests in science and technology, exposing them to a wide variety of research fields at Sandia and working closely with them on various projects of value to Sandia as well as tailored to enable them to learn and develop new skills.

Jeff and Sylvia in Patagonia

Selected Education and Outreach Presentations and Activities

2012	Mentor to four high school (rising senior) summer interns.
2011 03 21	Lecture on "Solid-State Lighting" to undergraduate technical writing class at the University of New Mexico, Albuquerque, NM.
2011–2012	Advised two students from Wilmette Junior High School (in Illinois) on their entry in the 2012 ExploraVision program/competition sponsored by Toshiba and the National Science Teachers Association (NSTA).
2010 03 31	Academy Lecture on "The Next Semiconductor Revolution:This Time It's Lighting!" at the Albuquerque Academy, Albuquerque, NM.
2010–2012	Volunteer developer and staffer of solid-state lighting exhibits at Sandia's Take Your Daughters and Sons to Work Days.
2009–2010	Volunteer scientist in the Explora Museum's Portal to the Public program. Helped develop an exhibit on "Making White Light from Two or Three Colors," with four "showings" at the Explora to the public and young children, and subsequent showings at other venues (e.g., March 4, 2010 at the Math, Science and Technology Showcase at Vista Grande Elementary School; July 16–20, 2012 at the Hands-On Learning in Smart Lighting for pre-college students at University of New Mexico Engineering; and at several Sandia Take Your Daughters and Sons to Work Days.
2008 03 14	Lecture on "Some Simple Physics of Global Warming" to a high school physics class at the Bosque School, Albuquerque, NM.
2008	Advised a Yale freshman on a "nanotech" article he wrote for the Yale Globalist.
2005 10 26	Lecture on "The Next Semiconductor Revolution: This Time It's Lighting!" to OASIS (a nationwide organization for continued lifelong learning for people age 50+), Albuquerque, NM.
2005 07 03	Lecture on "The Next Semiconductor Revolution: This Time It's Lighting!" at Leisure World (an independent living retirement community), Seal Beach, CA.
2005 04 16	Lecture on "Solid-State Lighting: Lamps, Chips and Materials for Tomorrow" for the Association of Chinese American Engineers and Scientists, Albuquerque, NM.
2003–2005	Parent volunteer for the Albuquerque Boy Choir, Albuquerque, NM.
2003	Mentor to one high school (rising senior) summer intern.
2002	Editor of Applause! Performing arts column for the Bosque Blue, the newsletter of the Bosque School, Albuquerque, NM.
2000–2012	Parent volunteer at local schools (Manzano Day School, Bosque School, Albuquerque Academy), Albuquerque, NM.
1998 Fall	On sabbatical, gave a series of 12 evening lectures on "Semiconductor Epitaxy: Science, Technology and Applications" to students and continuing-education industrial scientists at the Institute of Materials Research and Engineering and the National University of Singapore.
1996 10	Lecture on "Careers in Science and Technology at National Laboratories" given at the American Vacuum Society Meeting, Philadelphia, PA.

1996 07	Lecture on "Careers at Sandia" at the Asian Leadership Outreach Committee workshop, Albuquerque, NM.
1992–2012	Ongoing sponsor, with Sylvia Tsao (his wife), of annual Evan J. Tsao Memorial Award for "Best Exhibit in Environmental Science" at the annual NM Regional Science & Engineering Fair.
1992–2000	Volunteer judge at annual New Mexico Regional Science & Engineering Fair.

Jeff demonstrating LED lighting to youths at the annual Take Your Daughters and Sons to Work Day.

The family in Amsterdam in 1998.

Jeff and his family in 2008.

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September 18, 2012

To: Chinese Institute of Engineers-USA (CIE/USA)

It is a great pleasure to write this letter of recommendation for Jeff Tsao's nomination for AAEOY Engineer of the Year 2013. We have known Jeff for over twenty years, the most recent ten as his senior manager and center director. Jeff has had a remarkably varied career, spanning a wide range of activities from pure scientific research to research management. In addition, he has performed outstanding service to his institution (Sandia National Laboratories) and the larger national and global research enterprise.

In Jeff's early career, he built a reputation for both scientific depth and breadth. In the work he is most known for, he pioneered several important results in the then-emerging field of epitaxy science. Among his accomplishments are his initiation and leadership of major scientific research programs in epitaxy; a well-known book (Materials Fundamentals of Molecular Beam Epitaxy, published by Academic Press); and a lecture series given at the Institute of Materials Research & Engineering in Singapore. Jeff's book won Martin Marietta's two highest corporate awards: the Jefferson Cup and Author of the Year. Jeff's scientific papers have received an extraordinary 2,900 citations, and his current H-Index is 28. Jeff is a Fellow of both the American Physical Society and the American Association for the Advancement of Science, and has 9 patents.

In Jeff's middle career he served as a manager of a semiconductor physics research department at Sandia. In this role, he started several bold and risky initiatives, which ultimately proved successful. These include the use of science-based MOCVD (metal-organic chemical vapor deposition) to fabricate VCSELs (vertical cavity surface emitting lasers) and other high-precision semiconductor devices; and research into GaN-based semiconductor materials and devices. These bets led to several multi-$M/year CRADAs (cooperative research and development agreements) in the 1990s (HP, Motorola, Emcore), and ultimately led to Jeff taking a one-year entrepreneurial leave from Sandia National Laboratories to become VP of R&D at a start-up VCSEL company (E2O). Jeff's network within the compound semiconductor industry is simply remarkable. He also found time during this period to recruit and mentor numerous staff, many of whom have gone on to their own stellar careers.

In Jeff's later career, he initiated Sandia's program in solid-state lighting, and within solid-state lighting led new strategic scientific directions (most recently shallow narrow-linewidth red emitters, ultra-efficient lasers, analyses of chip power density and cost trade-offs, and the "rebound effect" in energy economics). He was lead author and editor of Sandia National Laboratories' successful $18M SSLS EFRC (Solid-State Lighting Science Energy Frontier

Research Center) proposal. This EFRC, funded through the U.S. Department of Energy, is emerging as one of the best of the nation's 46, due to the tremendous creativity, insight, and diligence that Jeff has brought to the Center. He also volunteered his time as a detailee to the DOE (Department of Energy) Office of Science, where he built a unique reputation as the innovative coordinator of the high-profile "Basic Research Needs for Solar Energy" workshop. This workshop provided the model for DOE's subsequent "BRN" workshops, and helped spawn the DOE Office of Science's $777M investment in the 46 Energy Frontier Research Centers. Jeff also has deep respect from the DOE Office of Energy Efficiency and Renewable Energy, having been editor of DOE EERE's first complete SSL technology roadmap in 2002, and often serving on EERE Program Planning panels.

In sum, Jeff has gained, over the years, international stature as a thought-leader in solid-state lighting and other areas of science and technology. He routinely gives invited and plenary talks at international conferences across the globe. Jeff's most recent invited talk was in August, 2012 at the invitation-only Nobel Symposium on Nanoscale Energy Converters, attended by other thought leaders in various areas of energy science and technology. This invitation is emblematic of Jeff's international stature, and his reputation as a brilliant thought-leader.

In summary, Dr. Jeff Tsao is an extraordinary researcher and thinker who has had an enormous impact in the area of innovative new semiconductor material systems and optoelectronic devices. Is impact is both deep and broad, and he is highly regarded on a wide international stage. It is truly our pleasure to support Jeff Tsao's nomination for AAEOY Engineer of the Year 2013.

Sincerely,

Jerry A. Simmons
Deputy Director for Semiconductors and Optical Sciences
Physical, Chemical and Nano Sciences Center 1100

J. Charles Barbour
Director
Physical, Chemical and Nano Sciences Center 1100

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Michael E. Coltrin, Ph.D.
Distinguished Member of Technical Staff
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E-mail mecoltr@sandia.gov

September 17, 2012

To the Chinese Institute of Engineers – USA (CIE/USA):

Jeff Tsao is one of the most outstanding staff members I have known in my 33 years at Sandia Labs. He exemplifies all of the values and characteristics to be awarded the high honor of being named Asian American Engineer of the Year 2013.

Jeff's career is characterized by *excellence*. He began his career at Sandia studying the materials science of epitaxial growth and related problems. He was extraordinarily successful and productive during this research period, from 1983 to 1991, publishing over 85 papers, which have been cited over 2,000 times. Indeed, had Jeff chosen to continue along this path as a research staff member he would undoubtedly be counted among the top handful of prolific and highly cited researchers at Sandia Laboratories. Jeff, however, decided to accept a position as first-level manager in one of our research departments. At this time, it was still feasible for a first-level manager to continue to do their own research. Jeff made a deliberate choice to discontinue his personal research in order to eliminate any possible conflict of interest in terms of resource allocation or priority setting between his own work and interests of his department. I have always admired this example of *integrity*, which is another hallmark characteristic of his career.

Jeff's *leadership* and *vision* are well documented in his singular role in crafting and leading Sandia's successful capture of our $18M Solid-State Lighting Science Energy Frontier Research Center (EFRC). However, this is only the most recent example. For example, as a manager Jeff was project manager and principal contact for Cooperative Research and Development Agreements (CRADAs) with Motorola, Hewlett-Packard, Emcore, and a DARPA-funded collaboration with Texas Instruments and Hughes. These programs established valued relationships and credibility with industry, the fruits of which continue today. For example, our existing and potential solid-state lighting partnerships with Philips Lumileds, Emcore, Veeco, and Bridgelux directly trace-back to personal relationships and trust established between Jeff and key industry staff members who went on to assume the leadership roles at our partner companies today. Indeed, Jeff's renown and contacts within the compound semiconductor industry are unique at Sandia.

Jeff's scientific *judgment* and *perspective* are widely recognized across the Laboratory. For example, he is routinely asked to serve as an evaluator on Grand Challenge LDRD proposals. In 2007 Jeff served as a key member of the "Stewardship Transformation Proposal" team at the request of Sandia's Executive Management to define a vision of, and approach to achieving, a possible multi-office (within DOE) or multi-agency sponsorship for Sandia National Laboratories. At the request of DOE / BES he authored a history of Sandia's interactions with the DOE Office of Science (OS), documenting case studies to illustrate synergies between Sandia's mission and OS goals. This study represents a broad cut across Sandia's OS research, encompassing scientific computing, geosciences, chemical sciences (CRF), as well as BES.

Jeff Tsao's scientific vision and the breadth and depth of his knowledge of semiconductor materials are unmatched in my experience at Sandia. He is greatly admired for his technical expertise, integrity, commitment to excellence, leadership, and vision. For these reasons, it is my extreme pleasure to nominate Jeff Tsao to be named as Asian American Engineer of the Year 2013.

No one who knows Jeff could help but celebrate his selection for this well-deserved recognition. I hope that you will agree.

Sincerely yours,

Michael E. Coltrin

Exceptional Service in the National Interest

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Mary H. Crawford, Ph.D.
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September 18, 2012

To the Chinese Institute of Engineers—USA:

It is my pleasure to recommend Dr. Jeffrey Tsao for the Asian American Engineer of the Year award. I am presently a Senior Scientist in Sandia's Physical, Chemical, and Nano Sciences Center and have worked with Jeff on numerous projects over the past 18 years. Through these close interactions I have gained a great appreciation for his impressive achievements and contributions and can only hope to give you a few examples in this short letter.

First, the distinguished level of Jeff's technical accomplishments is well documented. His more than 100 journal publications have had high impact, with more than 2700 cumulative citations. In my own field of Solid-State Lighting, Jeff co-authored a seminal paper that nucleated a national effort in that field. The external community has recognized the importance of Jeff's technical contributions by naming him fellow of both APS and AAAS.

Jeff's sphere of influence is unquestionably on an international level. Jeff is increasingly a keynote speaker at international conferences, one of a select few judged to have sufficient insight and mastery of a field to give such a presentation. Jeff is also highly sought as a member of technical review panels, both on a national and international level. What Jeff generously contributes in that capacity is not just in depth knowledge but an uncommon vision for new directions and technological possibilities.

Related to his vision, Jeff is one of the most creative scientists I have ever worked with. One of Jeff's most impressive abilities is to explore the boundaries between distinct concepts or fields, finding new synergies and insights. One example is his recent publications on the intersection between global economics and lighting technology, insights that have captured the interest of World Bank and other international entities. Jeff brings these abilities to great use as Chief Scientist of our Energy Frontier Research Center on Solid-State Lighting Sciences, guiding our team of 20+ scientists to find unexplored synergies that can make the greatest impact on the SSL field. I cannot count the number of times Jeff has opened my mind to new possibilities and believe he serves as an extraordinary role model for what an innovator should be.

Beyond these technical contributions, Jeff has had tremendous impact in a managerial role. In the early 1990's, I worked closely with members of Jeff's compound semiconductor materials growth department. At that time, materials growth, and particularly metal-organic vapor phase epitaxy, was often considered more of a "black art" than a well-controlled and predictable science. Jeff championed a new direction, leading his department in science-directed epitaxy, an effort that encompassed growth modeling as well as novel *in-situ* characterization techniques. One direct off-shoot was the innovation of the first visible vertical-cavity surface-emitting laser (VCSEL); a great accomplishment for Sandia (R&D 100 award, among others). Jeff's vision and leadership played a major role in the successful careers of many Sandia scientists and greatly contributed to Sandia's international reputation in compound semiconductor growth and devices.

Throughout my interactions with Jeff, I have found his character and integrity to be unassailable. It is without exaggeration that I say he is the most humble and generous collaborator I have ever worked with, *always* putting the benefit of his colleagues, Sandia, and, indeed, the international community, above his own. By his example, he is one of the precious few who truly inspires his colleagues to strive for excellence, not just in their careers, but on a personal level as well.

In summary, in his technical accomplishments, sphere of influence, creativity, vision, leadership, and personal character, Jeff Tsao has proven himself to be a highly distinguished member of Sandia's technical staff and a leader in the international community. It is my sincere hope that these accomplishments and attributes will be recognized with the prestigious Asian American Engineer of the Year Award.

Sincerely,

Mary H. Crawford

Exceptional Service in the National Interest

Letters of Recommendation

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

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September 17, 2012

Award Selection Committee
"Asian American Engineer of the Year 2013"

RE: Recommendation for **Dr. Jeffrey Tsao**, Sandia National Laboratory

Dear Chinese Institute of Engineers-USA (CIE/USA),

It is a great honor and pleasure to provide the strongest possible recommendation for the selection of Dr. **Jeffrey Tsao** of Sandia National Laboratory as the *Asian American Engineer of the Year 2013*. I base my recommendation on my close knowledge of Jeff's outstanding contributions to the technical literature and his unwavering technical leadership in the areas of energy efficiency.

I first came to know of Jeff through his work on stress relaxation in epitaxial film and subsequently through his seminal book *Materials Fundamentals of Molecular Beam Epitaxy*. Then later, I meet Jeff in the mid-1990s during my frequent visits to Sandia. In Jeff's archival papers and in his book, he provided the proper analytic framework for stress relaxation in epitaxial films – I have used Jeff's book as a guide in my work on stress relaxation in epitaxial ferroelectric films, mismatched III-V systems, and most recently semipolar GaN! Jeff's book is really misnamed, as it should have been given a title such as *Fundamentals of Epitaxy*. This book is a remarkable and coherent treatment of epitaxial growth and I make sure that all of my students study it carefully.

Around 2000, Jeff Tsao was the lead author with Jeff Nelson, Roland Haitz, Fred Kish (at that time both Kish and Haitz were with HP's Optoelectronic Division) of the highly influential position paper on the impact of Solid State Lighting on energy savings (*The case for a national research program on semiconductor lighting*). This document was written at the time that very few people in the technical community believed that LED-based lighting could produce enough light to be meaningful for illumination yet alone be more efficient than even incandescent or fluorescent lamps. After Shuji Nakamura's first demonstration of the white LED, the Tsao position paper was the most important step in the recognition of solid state lighting as a transformational technology for energy efficiency – this was a watershed event for GaN technology and of course for a clear win for energy efficiency.

Since Jeff's initial position paper on Solid State Lighting, he has been a tireless advocate for the technology and other technology. Jeff has also shown brilliance in his ability to synthesize information and provide new insight on technological data. I am always impressed with his

lectures such as his remarkable plenary talk on solid state lighting last year at Photonics West in San Francisco. As an example of Jeff's continued vision, he has advocated laser diode-based solid state lighting. Again, when Jeff first proposed these ideas, it was considered heresy! Now major lighting companies are seriously studying laser-based lighting. Automotive lighting companies, and major auto manufacturers already have prototype laser diode-based headlights!

I view Jeff as a national treasure. He is a great scientist and highly effective and influential advocate for new technology and energy efficiency. I highly support his nomination as Asian American Engineer of the Year.

Please do not hesitate to contact me you need any additional information.

Sincerely,

James S. Speck

James S. Speck

PHILIPS

Philips Lumileds Lighting Company

370 W. Trimble Road, San Jose, California 95131 USA

September 17, 2012

Chinese Institute of Engineers
USA (CIE/USA)

Dear CIE Awards Committee,

I am writing this letter in support of the nomination of Jeff Tsao for the Asian American Engineer of the Year 2013 award. I am happy to do this because Jeff is a person who I regard as one of the most knowledgeable and insightful people that I have interacted within the field of solid state lighting (SSL). I cannot address the other areas Jeff has been involved in because our interactions have been exclusively focused in SSL. Jeff has an in-depth understanding of the technical issues involved combined with a broad overview of the evolution of lighting and the potential impact of SSL on the lighting industry and on the environment. He has authored excellent and insightful publications. He is internationally recognized for his expertise in solid state lighting and has given invited presentations at international conferences, several of which I have had the pleasure of attending. I know I can count on Jeff's papers and presentations to be accurate, informative and most importantly, to have novel ideas which stimulate my thinking. He is an outstanding resource for the SSL community. In particular, he has worked closely with the DOE, providing information, participating on committees in planning research directions, and contributing to the writing of SSL reports and technical roadmaps.

Philips is the world's largest lighting supplier and Philips Lumileds is a leader in SSL. When Philips Lumileds has had interactions with Sandia, Jeff has always been one of our key contacts and has been instrumental in ensuring a productive interaction. In summary, I regard Jeff as an exceptional candidate for Asian American Engineer of the Year 2013 award.

Regards,

M. George Craford
Solid State Lighting Fellow
Philips Lumileds

PHILIPS

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LUMILEDS
LIGHT FROM SILICON VALLEY

Center for Integrated Nanotechnology
Jointly Operated By:
Los Alamos National Laboratory
Sandia National Laboratories

September 18, 2012

Chinese Institute of Engineers-USA (CIE/USA)

Subject: Recommend Advancement of Jeffrey Tsao to Distinguished Member of Technical Staff

Dear Selection Committee:

It is a pleasure to support the nomination of Jeffrey Tsao, a Distinguished Member of Technical Staff at Sandia National Laboratories, for the Asian American Engineer of the Year Award.. I have known Jeff since hiring him into my then group at Sandia in 1983 and have personally collaborated with him on a variety of projects. He is incredibly innovative and his work has had and continues to have great impact both nationally and internationally. In my view he superbly meets the criteria of the AAEOY.

Jeff's research contributions have covered a wide variety of topics from nonlinear optics, laser annealing and rapid solidification, to thin film growth and surface science, to strained layer epitaxy, to device science, and, most recently, to solid state lighting. He has had significant impact in each area he has taken up, as can be judged by his more than 100 publications and over 2700 citations, his being named a fellow of the APS and AAAS, being recognized by Sandia and Martin Marietta as 'author of the year' and receiving the Jefferson Cup, by his 14 edited books and book chapters, and by his numerous keynote and invited presentations, patents, and white papers. As direct evidence of his sphere of influence in his technical field and the high regard with which the community holds his expertise I would point out his multiple memberships on significant external advisory boards, including at the Univ. of Michigan, UCSB, USB, RPI (chair), Malaysia, and EERE.

Jeff is highly unusual among the research engineers in his ability to examine a subject in great depth and breadth at the same time. I have been continually amazed at his fresh thinking and deep insights into each area he has decided to study. As an early example he undertook work on strained layer superlattices and the associated strained epitaxy growth mechanisms, a major initiative at Sandia National Laboratories at the time. He proceeded to collaborate with both experimentalists and theorists to unravel the then confusion between metastable and equilibrium processes and the role of growth temperature in metastability. He played a key leadership role in this work which resulted in over 700 citations and further advanced Sandia's leadership role in the field.

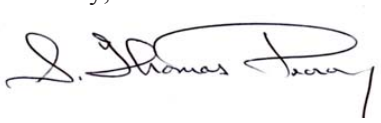
In recent work Jeff has been a critical person in Sandia's continued success in solid state lighting. Jeff has identified the most important and deep issues in the advance of solid state lighting. He has also represented Sandia externally with great effectiveness in these efforts and been a key spokesman for the unbiased assessment of this field. In doing this Jeff has exhibited excellent ability to work independently with great leadership, to display extremely good discretion and judgment, and to interact with external contacts with significant effectiveness and impact. As an example, he has been instrumental in Sandia's successful bid to win one of the

Providing the Scientific Basis for Nanomaterials Performance and Integration
MS K771, Los Alamos, New Mexico 87545, Phone: (505) 665-8554 Fax: (505) 665-9030

prestigious Department of Energy's Energy Frontier Research Centers (EFRC). This EFRC is on Solid State Lighting and Jeff serves as Chief Scientist for this program at Sandia. In personal discussions with Jeff this past year on where solid state lighting is headed, I have been continually impressed by the breadth of his insights, not only the obvious points, but the subtle underbelly of SSL that only comes with deep understanding and breadth of perspective. His historical analysis of civilization's use of lighting from candles to modern times, and its implications from a technical, economic, and energy use perspective in J. Physics D and in Energy Policy, has gain widespread attention, including such publications as The Economist.

The high esteem with which Jeff Tsao is held, his innovative approach to everything he takes up, and the attention his writings and lectures have garnered indicate that he is an outstanding candidate for Asian American Engineer of the Year. I am pleased to write this letter in strong support of his nomination.

Sincerely,



S. Thomas Picraux
Chief Scientist
Center for Integrated Nanotechnologies
Los Alamos National Laboratory

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