Faculty Profile of Chen S. Tsai

UC Irvine – Faculty Profile System

Chen S. Tsai
Chancellor's Professor, Electrical Engineering and Computer Science
The Henry Samueli School of Engineering
Faculty Affiliate, Institute of Surface and Interface Sciences
Faculty Affiliate, Integrated Nano Research Facility
Distinguished Professor, National Taiwan University, Taipei, Taiwan

Ph.D., Stanford University, 1965, Electrical Engineering
Phone: (949) 824-5144
Fax: (949) 824-3732
Email: cstsai@uci.edu
University of California, Irvine
Engineering Gateway Bldg.
Office S2224
Mail Code: ZOT 2625
Irvine, CA 92697

Research Interest	Silicon Photonics, Silicon Ultrasonic Nozzles for Biomedical Applications, Magnetic Microwave Filters, Magnonic Photonic Crystals
URL:	http://www.eng.uci.edu/user/138
Academic Distinctions	1. Member (Academician) of Academia Sinica (Taiwan, 2000) 2. Russian Academy of Engineering Sciences (Foreign Member, 2001) 3. 1995 International Microoptics Award (this biennial research award has been bestowed jointly by the Optical Society of Japan and the Japanese Applied Physics Society since 1989) 4. UC Irvine Faculty Senate Distinguished Faculty Lectureship for Research (1995) 5. Distinguished Alumnus Award of National Taiwan University in the category of Scholarly Research Achievement (2007) 6. Professor, Above-Scale, UC Irvine (1991) 7. Founding Director and Distinguished Research Fellow, Inst. For Applied Science and Engineering, Academia Sinica (1999-2002) 8. Distinguished Professorship, National Taiwan University (2004 –) 9. Awarded Endowed Chair Professorship at Carnegie-Mellon University (1979) 10. Taiwanese-American Foundation Prize in Science and Engineering (1991)

	11. Society Fellow of IEEE, OSA, IAE, SPIE, AAAS, and Russian Popov Society in 1982, 1983, 1983, 1987, 1992, and 2002, respectively 12. UC Irvine Lauds/Laurels Award for Distinguished Research (1987) 13. IEEE Ultrasonics/Ferroelectrics Soc. Distinguished Research Lectureship Award (1987) 14. Best Paper Award of IEEE Reliability and Electronic Devices Groups (1980) 15. Seven other Distinguished/Honorary Professorships of prestigious universities in Taiwan, China, and Japan 16. Outstanding Alumnus Award, College of Engineering, Utah State University (1984) 17. First UC Irvine Engineering Research Award (1986) 18. UC Irvine Engineering Instructor of The Year Award (1985)
Appointments	2008 – UC Irvine, Elec. Eng. and Comp. Sci. Chancellor's Professor 1991 – 2007 UC Irvine, Elec. Eng. and Comp. Sci. Professor, Above-Scale 2004 – National Taiwan University Honorary Distinguished Professor (pro bono) 1999 – 2002 (On leave) Academia Sinica (Taiwan), Institute for Applied Science and Engineering Distinguished Research Fellow and Founding Director 1980 – 1990 UC Irvine, Electrical Engineering Professor and Acting Department Chair 1969 –1980 Carnegie-Mellon Univ., Electrical Eng Assistant Professor to Endowed Chair Professor 1966 –1969 Lockheed Palo Alto Research Labs. Research Scientist 1966 –1967 Cal State Univ, San Jose, Electrical Eng. Assistant Professor
Research Abstract	Chen Tsai's earlier researches were in the fields of Integrated Optics (Guided-Wave Acoustooptics, Magnetooptics, and Electrooptics) and Acoustic Microscopy. His current research focuses on novel silicon-based optical and ultrasonic devices as well as magnetic materials-based microwave devices with real-world applications. Silicon (Si) has been the backbone material of most modern electronic devices such as computers and TV sets. There has been increasing R and D activities worldwide toward realization of next-generation Si-based optical devices and systems with increased capability and reduced production costs. The research thrusts of Tsai's group are: (1) passive and active devices relevant to the aforementioned goal, (2) Si-based high frequency ultrasonic nozzles capable of producing monodisperse droplets, highly desirable in biomedical applications such as pulmonary drug delivery, and (3) magnetic microwave filters for applications in communication and signal processing systems.
Publications	141 journal papers (21 by invitation) and 239 conference proceedings (80 by invitation), 1 topical volume, 14 encyclopedia/book chapters. Selective publications are as follows: 1. C. S. Tsai and S. K. Yao, "Bragg Diffraction by Standing Ultrasonic Waves with Application to Optical Demultiplexing," J. Appl. Phys., Vol.43, pp.5081-5084, 1972 2. C. S. Tsai, Le T. Nguyen, S. K. Yao and M. A. Alhaider, "A High Performance Acoustooptic Guided-Light Beam Device Using Two Tilting Surface Acoustic Waves," Appl. Phys. Lett., Vol.26, pp.140-142, 1975 3. C. S. Tsai and P. Saunier, "Guided-Light Beam Deflection and Switching Using Electrooptic Prism Structure in $LiNbO_3$ Waveguides," Appl. Phys. Lett., Vol.27, pp.248-250, 1975 4. B. Kim and C.S. Tsai, "High-Performance Guided-Wave Acoustooptic Scanning Devices Using Multiple Surface Acoustic Waves," Proc. IEEE, Vol.64, Special Issue on Surface

Acoustic Waves, pp.788-793, 1976 (Invited Paper)

5. W.S.C. Chang, C.S. Tsai, R.A. Becker, and I.W. Yao, "Convolution Using Guided Acoustooptical Interaction in Thin-Film Waveguides," IEEE J. Quantum Electronics, Vol.QE-13, pp.208-215, 1977
6. C. S. Tsai, S. K. Wang, and C. C. Lee, "Visualization of Solid Material Joints Using a Transmission-Type Scanning Acoustic Microscope," Appl. Phys. Lett., Vol.31, pp.317-320, 1977
7. C. S. Tsai, B. Kim and F. Akkari, "Optical Channel Waveguide Switch and Coupler Using Total Internal Reflection," IEEE J. Quantum Electron., Vol.QE14, pp.513-517, 1978
8. C. S. Tsai, "Guided-Wave Acoustooptic Bragg Modulators for Wideband Integrated Optic Communications and Signal Processings," Special Issue on Integrated and Guided Wave Optical Circuits and Systems, Vol.CAS-26, pp.1072-1098, 1979. (Invited paper) Nominated by IEEE Circuit and Systems Society for IEEE Donald Fink Award
9. C. C. Lee, K. Y. Liao, C. L. Chang, and C. S. Tsai, "Wideband Guided-Wave Acousto-Optic Bragg Detector Using a Tilted-Finger Chirp Transducer," IEEE J. Quantum Electron, Vol.QE-15, pp.1166-1170, 1979
10. J. K. Wang and C. S. Tsai, "Reflection Acoustic Microscopy for Thick Specimens," J. Appl. Phys., Vol.55, pp.80-88, 1984
11. D. Y. Zang and C. S. Tsai, "Single-Mode Waveguide Microlenses and Microlens Arrays Fabrication Using Titanium Indiffusion Proton Exchange Technique in $LiNbO_3$," Appl. Phys. Lett., Vol.46, pp.703-705, 1985
12. Q. Li, C. S. Tsai, S. Sottini, and C. C. Lee, "Light Propagation and Acoustooptic Interaction in a $LiNbO_3$ Spherical Waveguide," Appl. Phys. Lett., Vol.46, pp.707-709, 1985
13. C. S. Tsai, D. Young, W. Chen, L. Adkins, C. C. Lee, and H. Glass, "Noncollinear Magnetooptic Interaction of Guided-Optical; Wave and Magnetostatic Surfaces Waves in YIG/GGG Waveguides," Appl. Phys. Lett., Vol.47, pp.651-654, 1985
14. C. J. Lii, C. S. Tsai, and C. C. Lee, "Wideband Acoustooptic Bragg Cells in GaAsGaAlAs Waveguides," IEEE J. Quantum Electron., Vol.QE-22, Special Issue on Integrated Optic Circuits, pp.868-872, 1986
15. X. Cheng and C. S. Tsai, "Electrooptic Bragg-Diffraction Modulator in GaAsGaAlAs Heterostructure Waveguide," J. Lightwave Technology: Special Issue on Integrated Optic, Vol.6, pp.809-817, 1988
16. T. Vu, J. Norris, and C. S. Tsai, "Planar Waveguide Lenses in GaAs Using Ion Milling," Appl. Phys. Lett., Vol.54, pp.1098-1100, 1989
17. D. Young and C. S. Tsai, "X-Band Magnetooptic Bragg Cells Using Bismuth-Doped Yttrium Iron Garnet Waveguides," Appl. Phys. Lett., Vol.54, pp.2242-2244, 1989
18. Y. Abdelrazek, C. S. Tsai, and T. Q. Vu, "An Integrated Optic RF Spectrum Analyzers in A ZnO-GaAs-AlGaAs Waveguide," IEEE J. Lightwave Tech., Vol.8, pp.1833-1838, 1990
19. C. S. Tsai and P. Le, "A 4 X 4 Nonblocking Integrated Acoustooptic Space Swithc," Appl. Phys. Lett., Vol.60, pp.431-433, Jan. 1992
20. C. S. Tsai, "Integrated Acoustooptic Circuits and Applications," IEEE Trans, Ultrasonics, Ferroelectrics and Frequency Control, Vol.39, pp.529-554, Sept. 1992 (Invited Distinguished Lecture Paper)

21. Z. Y. Cheng and C. S. Tsai, "Baseband Integrated Acoustooptic Frequency Shifter," Appl. Phys. Lett., Vol.60, pp.12-14, Jan. 1992
22. Y. Pu. C. L. Wang and C. S. Tsai, "Magnetostatic Backward Volume Wave-Based Guided-Wave Magnetooptic Bragg Cells and Application to Wide-Band Light Beam Scanning," IEEE Photonics Technology Lett., Vol.3, pp.462-465, May 1991
23. A. K. Roy and C. S. Tsai, "A 8 X 8 Symmetric Nonblocking Integrated Acoustooptic Space Switch Module in $LiNbO_3$," IEEE Photonics Technology Lett., Vol.4, pp.731-734, July 1992
24. G. D. Xu and C. S. Tsai, "Integrated Acoustooptic Heterodyning Device Modules in $LiNbO_3$ Substrate," Appl. Opt., Vol.31, GRIN Special Issue, pp.5259-5268, Sept. 1992
25. A. Kar-Roy and C. S. Tsai, "Integrated Acousto-optic Tunable Filters Using Weighted Coupling," IEEE J. Quantum Electron, Vo1.30, 1574-1586, 1994
26. C. S. Tsai, "Integrated Acoustooptic and Magnetooptic Bragg Cell Modules for Information Processing," IEEE Proc., Vol.84, Special Issue on Optical Information Processing, pp.853-869, 1996 (Invited Paper)
27. C. S. Tsai, "Magnetostatic Waves-Based Integrated Magnetooptic Devices and Applications," IEEE Trans. on Magnetics, Vol.32, pp.4118-4123, 1996 (Invited Paper)
28. S. C. Tsai, P. Luu, P. Childs, A. Teshome, and C. S. Tsai, "The Role of Capillary Waves in Two-Fluid Atomization," Physics of Fluids, Vol.9, 2909-2918, 1997
29. C. S. Tsai, Y..S. Lin, J. Su, and S. Calciu, "High Efficiency Guided-Wave Magnetooptic Bragg Cell Modulator Using Nonuniform Bias Magnetic Field," Appl. Phys. Lett., Vol.70, pp.3185-3187, 1997
30. D. Grolemund and C.S. Tsai, "Statistical Moments of Backscattered Ultrasound in Porous Fiber Reinforced Composites," IEEE Trans. Ultrasonics/Ferroelectrics/Frequency Control, Vol.45, pp.295-304, 1998
31. C.S. Tsai, D. Young, and S. Nikitov, "Microwave and Magnetooptic Measurements of Nonlinear Dispersive Magnetostatic Wave in YIG Waveguides, "J. Appl. Phys., Vol. 84, 1670-1679, 1998
32. A. M. Matteo, C. S. Tsai, and N. Do, "High-Efficiency Collinear Guided-Wave Acoustooptic Interactions in $LiNbO_3$," IEEE Trans. on Ultrasonics, Ferroelectrics and Frequency Control, Vol.47, pp.16-28, 2000
33. S. C. Tsai, P. Luu, P. Tam, G. Roski, and C. S. Tsai, "Flow Visualization of Taylor-mode Breakup of a Viscous Jet," AIP Physics of Fluids, Vol.11, pp.1331-1341, 1999
34. C.S. Tsai, and J. Su, "A Wideband Electronically Tunable Microwave Notch Filter Using Iron-Garnet-Gallium Arsenide Layer Structure," Appl. Phys. Lett., Vol.74, pp.2079-2880, 1999
35. C. S. Tsai, J. Su, and C. C. Lee, "Wideband Microwave Notch Filter Using Iron-Gallium Arsenide Layer Structure," IEEE Trans. On Magnetics, Vol. 35, 3178-3180, 1999
36. C. S. Tsai, "Tunable Devices Using Ferromagnetic Film-GaAs," J. of Mag. and Mag. Mat, Vol.209, 10-14, 1999 (Invited Paper)
37. C. S. Tsai, W. Chen, P. Le, and S. C. Tsai, "Acousto-optic Interactions/Devices in Spherical Waveguide," J. of Optics A: Pure and Appl. Optics, Vol.3, S46-S53, 2001 (Invited Paper)
38. S. A. Nikitov, Ph. Tailhades, and C. S. Tsai, "Spin Waves in Periodic Magnetic Structures-Magnonic Crystals," J. of Mag. and Mag. Mat, Vol.236, 320-330, 2001
39. W. Wu, C. C. Lee, C. S. Tsai, H. Hopster et al., "Epitaxial Fe/Ag Films" J. of Crystal

	Growth., Vol.225, 534-539, 2001 40. S.C. Tsai, Y.L. Song, T.K. Tseng, Y.F. Chou, W.J. Chen, and C.S. Tsai, "High Frequency Silicon-Based Ultrasonic Nozzles Using Multiple Fourier Horns," IEEE Trans. on Ultrasonics/Ferroelectrics and Frequency Control, 51, 277-286, 2004 41. M.J. Chen, J.L. Yen, J.Y. Li, J.F. Chang, S.C. Tsai, and C.S. Tsai, "Stimulated Emission in a Nanostructured Silicon PN Junction Diode Using Current Injection," Applied Physics Letters, 84, 2163-2166, 2004 (selected for inclusion in the March 26, 2004 issue of *Virtual J. of Nanoscale Science and Technology*) 42. Y.V. Gulyaev, S.A. Nikitov, C.S. Tsai, et al., "Ferromagnetic Films with Magnon Bandgap Periodic Structures: Magnon Crystals," JETP Letters, 77, 567-570, 2003 (selected for inclusion in *Virtual J. of Nanoscale Science and Technology*) 43. K. Shiraishi and C.S. Tsai, "A Micro Light Beam Spot-Size Converter Using Hemi-Cylindrical GRIN-Slab Tip," *J. of Lightwave Technology*, 23, 3821-3826, 2005 44. C.S. Tsai, G. Qiu, H. Gao, G.P. Li, L.W. Yang, and S.A. Nikitov, "Tunable Wideband Microwave Band-Stop and Band-Pass Filters Using YIG/GGG-GaAs Layer Structures," *IEEE Transaction on Magnetics*, 41, 3568-3570, 2005 45. S.C. Tsai, Y.L. Song, C.S. Tsai, Y.F. Chou, and C.H. Cheng, "Ultrasonic Atomization Using MHz Silicon-Based Multiple-Fourier Horn Nozzles," Applied Physics Letters, 88, 014102, January 2, 2006 (selected for inclusion in the January 16, 2006 issue of *Virtual Journal of Nanoscale Science and Technology*) 46. M. J. Chen, C. S. Tsai, and M.K. Wu, "Optical Gain and Co-Stimulated Emission of Photons and Phonons in Indirect Bandgap Semiconductors," *Japanese J. of Applied Physics*, 45, 6576-6588, 2006 (Invited Paper) 47. H. Yoda, H. Ikedo, T. Ketsuka, A. Irie, K. Shiraishi, and C.S. Tsai, "A High-Performance Micro-GRIN-Chip Spot-Size Converter Formed with Focused Ion Beam," *IEEE Photonics Tech. Lett.*, 18, 1554-1556, 2006 48. H. Yoda, H. Ikedo, K. Shiraishi, and C.S. Tsai, "A Silicon-Based Spot-Size Converter between Single-Mode Fibers and Si-Wire Waveguide using Cascaded Tapers," *Applied Physics Letters*, 91, Oct. 1, 141120, 2007 49. G. Qiu, C.S. Tsai, M.M. Kobayashi, and S.T. Wang, "Enhanced Microwave Ferromagnetic Resonance Absorption and Bandwidth Using A Microstrip Meander-Line Step-Impedance Low Pass Filter in A YIG-GaAs Layer Structure," (Special Issue of *Journal of Applied Physics*, May 2008, In Press) 50. R.W. Mao, C.S. Tsai, J.Z. Yu, and Q.M. Wang, "Narrow Line-Width Resonant Cavity Enhanced Photdetectors Operating at 1.55 μm," (Optic Communications, 2008, In Press)
Professional Societies	**Editorship and Edited Volumes** 1. Associate Editor of the topical areas, Optical Interactions and Acoustooptic Interactions and Devices, IEEE Transactions on Ultrasonics/Ferroelectrics and Frequency Control (1980-1992) 2. Member of the Editorial Board, Microwaves and Optics Letters (1987-) 3. Member of Editorial Board, International Journal of High Speed Electronics (1989-) 4. Member of Editorial Board, International Journal of Photonics and Optoelectronics (1991-) 5. Member of Editorial Board, Journal of Fiber and Integrated Optics (1993-) 6. Editor-in Chief, Springer-Verlag Volume Series in Electronics and Photonics entitled,

	Guided-Wave Acoustooptic Bragg Interactions, Devices, and Applications, (a total of eight chapters, 332 pages, 1990) 7. Co-Editor (Chief Editor in U.S.A.), Journal of wave Electronics (1982-84). 8. Associate Editor, Journal of Optical Engineering (1982-84). 9. Member of Editorial Board on Laser and Electro-Optic Science and Technology, Comtex Scientific Publishing Col (1982-84) 10. Co-Editor of special Issue on "Acoustooptics" in Applied Optics (2008) 11. Delivered some 190 invited lectures and seminars on Integrated Optics, Acoustooptics, Magnetooptics, and Acoustic Microscopy at prestigious universities and research institutes in the U.S. and abroad. **International Lecture Tour** As the 1986-1987 Distinguished Lecturer of the IEEE Ultrasonics/Ferroelectrics/Frequency Control Society, Tsai was invited to deliver some 50 lectures at the technical conferences, professional societies and prestigious universities, and industrial laboratories in the U.S. and abroad including Japan, West Germany, Soviet Union, Switzerland, France, and China. The lectures were focused on Guided-Wave Acoustooptic Interactions, Devices, and Applications"--an emerging science and technology to which Tsai has made pioneering and sustained contributions. **Conference Chairmanship** A partial list is given as follows: 1. Chairman of NSF Meeting on Optical Communications, Pittsburgh, PA, June 5-7, 1978; also served on a panel on Optical Communications Research in Japan, Chaired by Professor John Whinnery. 2. Co-Chairman of Technical In-Depth-Seminar on Real-Time Signal Processing, Meeting of the Society of Photo-Optical Instrumentation Engineers, April 19-20, 1979, Washington, D.C. 3. Chairman of the Seminar-in Depth on Guided-Wave Optical Deices Systems and Applications, International SPIE Technical Symposium, July 28-August 1, 1980, San Diego, CA. 4. Chair of Conference on Guided-Wave Optoelectronics, July 7-12, 1983, Taipei, Taiwan. 5. Chair of Army Research Office Workshop on Optical Switching Technology, March 26-28, 1984, UC Irvine. 6. International Workshop on Nonlinear Interactions in Magnetic and Magnetooptic Materials, (Dec. 12-24, 1993, UC Irvine, Co-organizer). 7. Stanford Bert Auld Conference, June 20, 1998, Stanford University, CA (Chair). 8. 7th International Workshop on Modern Acoustics and Ultrasonics, Oct. 11-14, 1998, Nanjing, China (Co-Organizer and Co-Chair). 9. International Symposium on Advanced Magnetics Technology, Nov. 14-16, 1999, Taiwan (Conference Co-Chair).
Other Experiences	Provided technical consulting services to more than 22 prestigious high-tech research laboratories such as Xerox, Eastman Kodak, United Technology, Rockwell International, Westinghouse, IBM, Bell Labs, and General Electric.