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JOINT SERVICES ELECTRONICS PROGRAM

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(Contract F49620-87-C-0041)  
(1 May 1987 — 31 May 1990)

W. G. Oldham and C. Hu

31 July 1990

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Bolling Air Force Base  
Washington, DC 20332

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# JOINT SERVICES ELECTRONICS PROGRAM

FINAL REPORT  
May 1987 - May 1990

## DIRECTOR'S OVERVIEW

The Joint Services Electronics Program (JSEP) is an important part of the electronics research at the University of California, Berkeley. JSEP is particularly important to the development of new research directions and new faculty investigators. It also provides much needed support for the more basic electronics research. Furthermore, JSEP has encouraged collaborative research involving multiple principal investigators per project.

Over the period May 1987 to May 1990 JSEP has supported 20 faculty investigators, 57 students and produced 65 publications in journals or conference proceedings, 14 Ph.D. degrees and 22 M.S. degrees.

The research program is organized into two themes: high-speed wide-band elements for high frequency electronics, and new architecture for parallel computation. Under the program, several important new phenomena were discovered for highly scaled MOSFETs and the world's fastest room temperature silicon transistor (22ps, fastest for either bipolar or MOS transistors) was fabricated. Nonlinear guided-wave devices such as optical correlator and spectrometer were created. Techniques for achieving tolerance and efficient programming in artificial neural networks were found.

The most productive work units of the present program will be expanded and continued in the next three-year JSEP contract. The new program is organized around three themes: quantum electronics, electronic devices, and neural networks.



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## LISTING OF PRINCIPAL INVESTIGATORS

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Theodore Van Duzer  
Pravin Varaiya  
Shyh Wang  
Eugene Wong

**STUDENTS PARTIALLY OR FULLY SUPPORTED BY JSEP: DEGREES AWARDED**

Student	Degree	Year
Behtash, Saman	Ph.D.	88
Boothe, Robert	M.S.	89
Bruns, Michael	M.S.	89
Casinovi, Giorgio	Ph.D.	88
Chang, Hasn	Ph.D.	88
Chang, Hua-Chen	Ph.D.	90
Chen, Jian	M.S.	88
Chinrungrueng, Chesada	M.S.	89
Chung, James	M.S.	88
Cieslak, Randall	Ph.D.	88
Cline, David	M.S.	89
Fang, Jiayuan	Ph.D.	89
Fawaz, Ayma	Ph.D.	88
George, Peter	M.S.	87
Gollu, Aleks	M.S.	89
Hsin, We	M.S.	87
Hu, Victor	M.S.	88
Lee, Henry	Ph.D.	89
Lee, Huey	M.S.	89
Lo, Yu-Hwa	Ph.D.	87
Moon, James	M.S.	88
Moroney, Richard	M.S.	88
Murray, Richard	M.S.	88
Osofsky, Sam	M.S.	87
Pai, Pei-lin	Ph.D.	87
Pister, Kris	M.S.	89
Raghunath, Mandayam	M.S.	88
Raman, Shankar	M.S.	88
Scheckler, Ed	M.S.	88
Song, Joon	Ph.D.	88
Tsay, Jenngang	M.S.	89
Tsay, Ren-Song	Ph.D.	89
Vakhshoori, Daryoosh	Ph.D.	89
Venkatraman, Shobana	M.S.	88
Wong, Hing	Ph.D.	89
Zivanovic, Svetlana	M.S.	89

**14 Ph.D.'s and 22 M.S.'s**

## PUBLICATIONS/PRESENTATIONS

May 87 - May 90

### Hu

T.Y. Chan, J. Chen, P.K. Ko and C. Hu, "The Impact of Gate-Induced Drain Leakage Current on MOSFET Scaling," presented at the IEEE Electron Device Meeting, Washington, D.C., December 6-9, 1987.

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E.W. Scheckler, D.E. Lyons, A.R. Neureuther, W.G. Oldham, "Process Simulation and Experiment for RC-Parasitics in Multilevel Metallization," *Proceedings IEEE VLSI Multilevel Interconnection Conference*, Santa Clara, California, June 1989, p. 130-137.

H.C. Wu, A.S. Wong, Y.L. Koh, E.W. Scheckler, and A.R. Neureuther, "Simulated Profiles From the Layout - Design Interface in X (SIMPL-DIX)," *IEDM Technical Digest*, December 1988.

### Oldham

E.W. Scheckler, D.E. Lyons, A.R. Neureuther, W.G. Oldham, "Process Simulation and Experiment for RC-Parasitics in Multilevel Metallization," *Proceedings IEEE VLSI Multilevel Interconnection Conference*, Santa Clara, California, June 1989, p. 130-137.

### Sangiovanni-Vincentelli

A. Kramer and A. Sangiovanni-Vincentelli, "Efficient Parallel Learning Algorithms for Neural Networks" *Proc. of the 1988 IEEE Conf. on Neural Information Processing Systems-Natural and Synthetic*, Morgan Kauffman Publishers, San Mateo, CA, 1989.

A. Kramer, "Learning Despite Distribution Drift," in *Proc. of the 1988 Connectionist Models Summer School* pages 38-51, Morgan Kaufmann Publishers, San Mateo, CA, 1989.

B. Moore, M. Fogaca, and A. Kramer, "Characterizing the Error Function of a Neural Network," *Proceedings of the 1988 Conference on Massively Parallel Processing*, (publisher unknown, conference held at George Mason University Fairfax, VA in October 1988.)

### Sastry

N. Nordstrom, "Parameter Convergence and Stability in Continuous-Time Indirect Adaptive Control," *Proceedings of the IFAC Workshop*, Newcastle, Australia, August 22-24, 1988, pp. 11-14.

### Schwarz

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### Smith

P.J. Harshman, K.J. Malloy and AlInAs, J. Walker, S. Wang and J.S. Smith, "MBE Growth of High Quality (III)B GaAs, GaInAs and AlInAs," presented at the Materials Research Society, 1990 Spring Meeting, and to be published in the *MRS Symposium Proceedings*.

H. P. Lee, Y.-H. Huang, X.-M. Liu, H. Lin, J. S. Smith, E. R. Weber, P. Yu, S. Wang, and Z. Liliental-Weber, "Photoluminescence and Transmission Electron Microscopy Studies of Selective-Area Molecular Beam Epitaxy of GaAs Film on Si and Tensile Stress Relief by Chemical Etching of GaAs on Si Sample," *MRS Symposium Proceedings*, Vol. 116, pp. 219 (1988).

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H. P. Lee, Y. H. Huang, X. M. Liu, H. Lin, J. S. Smith, E. R. Weber, P. Yu, S. Wang, Z. Liliental-Weber and Y. Z. Huang. "Tensile Stress Variation of Chemically Etched GaAs Film Grown on Si Substrate," *Appl. Phys. Lett.*, 53, 2394, 1988.

D. Vakhshoori, J. Walker, S. Wang, J. S. Smith, C. E. Soccolich and M. N. Islam, "Integrable Optical Correlator; Its Temporal Resolution, Spectral Response and Power Sensitivity," accepted for publication in *Appl. Phys. Lett.*

D. Vakhshoori, J. Walker, S. Dijaili, S. Wang, and J.S. Smith, "Integrable Parametric Waveguide Spectrometer -- A Nonlinear Optical Device Capable of Resolving Modes of Semiconductor Lasers," *Appl. Phys. Lett.*, 55(12), September 18, 1989, pp. 1164-1166.

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#### Van Duzer

K.K. Mei, G.C. Liang, and T. Van Duzer, "Electromagnetics of Superconductors," *IEEE AP-S International Symposium Digest*, San Jose, California, June 26-30, 1989.

#### Varaiya

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#### Wang

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