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Undergraduate Research Participation in Electrical Engineering

John F. Vetelino

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Final Report for Period: 03/1996 - 02/1999**Submitted on:** 11/10/1999**Principal Investigator:** Vetelino, John F.**Award ID:** 9531378**Organization:** University of Maine**Title:**

Undergraduate Research Participation in Electrical Engineering

Project Participants

Senior Personnel

Name: Vetelino, John**Worked for more than 160 Hours:** Yes**Contribution to Project:**

John Vetelino served as the principal investigator for the project. He was supported by the NSF-REU contract for the equivalent of .5 months each year. He also received support from other research contracts.

Name: Lad, Robert**Worked for more than 160 Hours:** No**Contribution to Project:**

Bob Lad acted as the advisor for several NSF-REU students. Support for Robert Lad was obtained from sources other than the NSF-REU grant.

Name: Dwyer, Daniel**Worked for more than 160 Hours:** No**Contribution to Project:**

Dan Dwyer acted as the advisor for several NSF-REU students. Support for Dan Dwyer was obtained from sources other than the NSF-REU grant.

Name: Musavi, Mohamad**Worked for more than 160 Hours:** No**Contribution to Project:**

Mohamad Musavi acted as the advisor for several NSF-REU students. Support for Mohamad Musavi was obtained from sources other than the NSF-REU grant.

Name: Segee, Bruce**Worked for more than 160 Hours:** No**Contribution to Project:**

Bruce Segee acted as the advisor for several NSF-REU students. Support for Bruce Segee was obtained from sources other than the NSF-REU grant.

Name: Patton, James**Worked for more than 160 Hours:** No**Contribution to Project:**

Jim Patton acted as the advisor for several NSF-REU students. Support for Jim Patton was obtained from sources other than the NSF-REU grant.

Name: Hummels, Donald**Worked for more than 160 Hours:** No**Contribution to Project:**

Don Hummels acted as the advisor for several NSF-REU students. Support for Don Hummels was obtained from sources other than the NSF-REU grant.

Name: Frankel, David**Worked for more than 160 Hours:** No**Contribution to Project:**

David Frankel acted as the advisor for several NSF-REU students. Support for David Frankel was obtained from sources other

than the NSF-REU grant.

Name: Kleban, Peter

Worked for more than 160 Hours: No

Contribution to Project:

Peter Kleban acted as the advisor for several NSF-REU students. Support for Peter Kleban was obtained from sources other than the NSF-REU grant.

Name: Irons, Fred

Worked for more than 160 Hours: No

Contribution to Project:

Fred Irons acted as the advisor for several NSF-REU students. Support for Fred Irons was obtained from sources other than the NSF-REU grant.

Name: Andle, Jeffrey

Worked for more than 160 Hours: No

Contribution to Project:

Jeff Andle acted as the advisor for several NSF-REU students. Support for Jeff Andle was obtained from sources other than the NSF-REU grant.

Name: Lec, Ryszard

Worked for more than 160 Hours: No

Contribution to Project:

Ryszard Lec acted as the advisor for several NSF-REU students. Support for Ryszard Lec was obtained from sources other than the NSF-REU grant.

Post-doc

Graduate Student

Undergraduate Student

Name: Allen, Benjamin

Worked for more than 160 Hours: Yes

Contribution to Project:

Benjamin Allen worked under the direction of Robert Lad in the Summer of 1996 and his research topic was 'Development of a Hall Effect Measurement System for the Multi-User Thin Film Synthesis and Processing Facility at the Univ. of Maine.' He was supported 100% by the NSF-REU grant.

Name: Amos, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Michael Amos worked under the direction of Bruce Segee in the Summers of 1996 and 1997.

His research topic in 1996 was 'Artificial Neural Networks Using Microsoft Excel for Windows 95.' He was supported 100% by the NSF-REU grant.

His research topic in 1997 was 'Artificial Neural Network OLE Controls for Windows 95.' He was supported 22% by the NSF-REU grant, 50% by Sensor Research and Development (SRD) and 28% by a federally funded work study program

Name: Crowley, Ryan

Worked for more than 160 Hours: Yes

Contribution to Project:

Ryan Crowley worked under the direction of John Vetelino in the Summer of 1996 and 1997.

His research topic in 1996 was 'Event-Driven Data Acquisition Software.' He was supported 100% by BIODE, Inc.

His research topic in 1997 was 'Acoustic Plate Mode Sensor Control Platform.' He was supported 37% by the NSF-REU grant and 63% by a federally funded work study program.

Name: Fern, Alan

Worked for more than 160 Hours: Yes

Contribution to Project:

Alan Fern worked under the direction of Mohamad Musavi in the Summer of 1996 and his research topic was 'Non-Linear Dynamic System Identification Using Multiresolution Networks of Locally Active Units.' He was supported 100% by the NSF-REU grant.

Name: Haskell, Reichl

Worked for more than 160 Hours: Yes

Contribution to Project:

Reichl Haskell worked under the direction of John Vetelino in the Summer of 1996 and his research topic was 'Design of a Mercury Vapor Source and SAW Sensor.' He was supported 34% by the NSF-REU grant and 66% by a federally funded work study program.

Name: Johnson, Julie

Worked for more than 160 Hours: Yes

Contribution to Project:

Julie Johnson worked under the direction of James Patton in the Summer of 1996 and her research topic was 'A Java Based Multimedia Power Plant Simulator.' She was supported 100% by the NSF-REU grant.

Name: Kelso, Gina

Worked for more than 160 Hours: Yes

Contribution to Project:

Gina Kelso worked under the direction of Donald Hummels in the Summer of 1996 and her research topic was 'Simulation of Current Steering Sigma-Delta Analog-to-Digital Converters.' She was supported 12% by the NSF-REU grant and 88% by departmental funds.

Name: Kenny, Thomas

Worked for more than 160 Hours: Yes

Contribution to Project:

Thomas Kenny worked under the direction of John Vetelino in the Summers of 1996, 1997, and 1998.

His research topic in 1996 was 'Detection of Nitric Oxide with a Ruthenium Doped Tungsten Trioxide Thin Film.' He was supported 100% by the NSF-REU grant.

His research topic in 1997 was 'A Chemiresistive Sensor for the Detection of Gaseous HCl.' He was supported 37% by the NSF-REU grant and 63% by a federally funded work study program.

His research topic in 1998 was 'Nitric Oxide, Viagra, and Lung Disease.' He was supported 100% by Sensor Research and Development (SRD).

Name: Ketch, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Michael Ketch worked under the direction of James Patton in the Summer of 1996 and he research topic was 'Labview.' He was supported 12% by the NSF-REU grant and 88% by a non-NSF research grant.

Name: Munson, Justin

Worked for more than 160 Hours: Yes

Contribution to Project:

Justin Munson worked under the direction of Jeffrey Andle in the Summer of 1996 and his research topic was 'Quartz Crystal Oscillator.' He was supported 100% by BIODÉ, Inc.

Name: Olcott, James

Worked for more than 160 Hours: Yes

Contribution to Project:

James Olcott worked under the direction of James Patton in the Summer of 1996 and his research topic was 'A Java Based Multimedia Power Plant Simulator.' He was supported 34% by the NSF-REU grant and 66% by a federally funded work study program.

Name: Ozier, Owen

Worked for more than 160 Hours: Yes

Contribution to Project:

Owen Ozier worked under the direction of Mohamad Musavi in the Summer of 1996 and his research topic was 'Analysis and Enhancement of a Neural Network Approach to Drainage Networks.' He was supported 41% by the NSF-REU grant and 59% by a non-funded NSF research grant.

Name: Pouwels, Seth

Worked for more than 160 Hours: Yes

Contribution to Project:

Seth Pouwels worked under the direction of Bruce Segee in the Summer of 1996 and his research topic was 'Visual Processing Using Windows 95.' He was supported 100% by the NSF-REU grant.

Name: Puri, Monica

Worked for more than 160 Hours: Yes

Contribution to Project:

Monica Puri worked under the direction of Donald Hummels in the Summer of 1996 and her research topic was 'Theory, Design, and Implementation of a Digital Comb Filter.' She was supported 100% by the NSF-REU grant.

Name: Qualey, Christopher

Worked for more than 160 Hours: Yes

Contribution to Project:

Christopher Qualey worked under the direction of John Vetelino in the Summer of 1996 and his research topic was 'An Analog Microheater Controller.' He was supported 72% by the NSF-REU grant and 28% by Sensor Research and Development (SRD).

Name: Roderick, Ryan

Worked for more than 160 Hours: Yes

Contribution to Project:

Ryan Roderick worked under the direction of Jeffrey Andle in the summer of 1996 and his research topic was 'Differential Counter.' He was supported 100% by BIODÉ, Inc.

Name: Snow, Diana

Worked for more than 160 Hours: Yes

Contribution to Project:

Diana Snow worked under the direction of Donald Hummels in the summer of 1996 and her research topic was 'C Implementation of Real-Time Systems.' She was supported 50% by the NSF-REU grant and 50% by a non-NSF research grant.

Name: Syversen, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

Jason Syversen worked under the direction of John Vetelino in the Summers of 1996 and 1997.

His research topic in 1996 was 'Acoustic Plate Mode Sensor Controller.' He was supported 100% by BIODE, Inc.

His research topic in 1997 was 'Acoustic Plate Mode Sensor Control Platform.' He was supported 37% by the NSF-REU grant and 63% by a federally funded work study program.

Name: Tibbetts, Kevin

Worked for more than 160 Hours: Yes

Contribution to Project:

Kevin Tibbetts worked under the direction of Daniel Dwyer in the Summer of 1996 and his research topic was 'FTIR Spectroscopy.' He was supported 100% by a non-NSF research grant.

Name: Tukey, Robert

Worked for more than 160 Hours: Yes

Contribution to Project:

Robert Tukey worked under the direction of David Frankel in the Summers of 1996 and 1997.

His research topic in 1996 was 'The Theory and Design of a Cryopump Regeneration Control Unit.' He was supported 100% by the NSF-REU grant.

His research topic in 1997 was 'The Fabrication and Testing of a Cryopump Regeneration Control Unit (CRCU).' He was supported 100% by the NSF-REU grant.

Name: Webb, Norman

Worked for more than 160 Hours: Yes

Contribution to Project:

Norman Webb worked under the direction of John Vetelino in the Summer of 1996 and his research topic was 'Investigation of the Glass Transition Temperature of 280,000 Molecular Weight Polystyrene Using a Surface Acoustic Wave Device.' He was supported 100% by the NSF-REU grant.

Name: Bell, Jeremy

Worked for more than 160 Hours: Yes

Contribution to Project:

Jeremy Bell worked under the direction of Ryszard Lec in the Summer of 1997 and his research topic was 'Data Acquisition Using the HP4195A Network Spectrum Analyzer via the World Wide Web.' He was supported 72% by the NSF-REU grant and 28% by a non-NSF research grant.

Name: Benoit, Patrick

Worked for more than 160 Hours: Yes

Contribution to Project:

Patrick Benoit worked under the direction of John Vetelino in the Summer of 1997 and his research topic was 'Effects of Film Thickness and Operating Temperature on a Surface Acoustic Wave Mercury Vapor Sensor'. He was supported 100% by the NSF-REU grant.

Name: Brissette, Pablo

Worked for more than 160 Hours: Yes

Contribution to Project:

Pablo Brissette worked under the direction of Robert Lad in the Summer of 1997 and his research topic was 'Activation of Chemical Reactions in Gas Sensors Using Ultra-Violet Light.' He was supported 100% by the NSF-REU grant.

Name: Cookson, Scott

Worked for more than 160 Hours: Yes

Contribution to Project:

Scott Cookson worked under the direction of Robert Lad in the Summer of 1997 and his research topic was 'Atomic Force Microscope Analysis of Ceramic Thin Film Materials.' He was supported 100% by the NSF-REU grant.

Name: Doogue, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Michael Doogue worked under the direction of David Frankel in the Summer of 1997 and his research topic was 'Vacuum and Controlled Atmosphere Hall Effect Measurements on Epitaxial WO₃ Thin Films.' He was supported 100% by the NSF-REU grant.

Name: Gahris, David

Worked for more than 160 Hours: Yes

Contribution to Project:

David Gahris worked under the direction of John Vetelino in the Summer of 1997 and his research topic was 'Two-film Gas Sensor.' He was supported 100% by the NSF-REU grant.

Name: Goodwine, Dale

Worked for more than 160 Hours: Yes

Contribution to Project:

Dale Goodwine worked under the direction of Peter Kleban in the Summer of 1997 and his research topic was 'Fabrication and Characterization of Sharp Probes for Studies of Mechanical Properties at the Nanometer Scale.' He was supported 100% by the Laboratory for Surface Science and Technology (LASST).

Name: Henderson, Casey

Worked for more than 160 Hours: Yes

Contribution to Project:

Casey Henderson worked under the direction of Donald Hummels in the Summer of 1997 and his research topic was 'Instrumentation Using Mex-Files.' He was supported 37% by the NSF-REU grant and 63% by a federally funded work study program.

Name: Kovaka, Molly

Worked for more than 160 Hours: Yes

Contribution to Project:

Molly Kovaka worked under the direction of Robert Lad in the Summer of 1997 and her research topic was 'Determining the Mechanisms of Oxide Thin Film Growth: Theoretical Modeling of Diffusion Processes.' She was supported 78% by the NSF-REU grant and 22% by a non-NSF research grant.

Name: Lenfest, Jeffery

Worked for more than 160 Hours: Yes

Contribution to Project:

Jeffery Lenfest worked under the direction of John Vetelino in the Summer of 1997 and his research topic was 'Frequency Characterization of WO₃ Films for Gas Sensing Applications.' He was supported 50% by the NSF-REU grant and 50% by Sensor Research and Development (SRD).

Name: Ouellette, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

Jason Ouellette worked under the direction of John Vetelino in the Summer of 1997 and his research topic was 'The Complete Installation and Troubleshooting of a Thin Film Metal Vacuum Deposition System.' He was supported 37% by the NSF-REU grant and 63% by a federally funded work study program.

Name: Piper, Andrew

Worked for more than 160 Hours: Yes

Contribution to Project:

Andrew Piper worked under the direction of Mohamad Musavi in the Summer of 1997 and his research topic was 'Automatic Feature Extraction from Digital Terrain Elevation Data.' He was supported 72% by the NSF-REU grant and 28% by a non-NSF research grant.

Name: Pringle, LeKisha

Worked for more than 160 Hours: Yes

Contribution to Project:

LeKisha Pringle worked under the direction of Peter Kleban in the Summer of 1997 and her research topic was 'Quantitative Analysis of an Oxide Thin Film Using the X-ray Photoelectron Spectrometer.' She was supported 100% by the Laboratory for Surface Science and Technology (LASST).

Name: Slopey, Derrick

Worked for more than 160 Hours: Yes

Contribution to Project:

Derrick Slopey worked under the direction of Bruce Segee in the Summers of 1997 and 1998.

His research topic in 1997 was 'Distributed Instrumentation Information via the World Wide Web.' He was supported 72% by the NSF-REU grant and 28% by a federally funded work study program.

His research topic in 1998 was 'Intelligent Simulation of Data Gathering in a Factory Setting.' He was supported 80% by the NSF-REU grant and 20% by a non-NSF research grant.

Name: Vought, Ray

Worked for more than 160 Hours: Yes

Contribution to Project:

Raymond Vought worked under the direction of Fred Irons in the Summer of 1997 and his research topic was 'Error Modeling of Narrow Band Nonlinear Network Functions.' He was supported 50% by the NSF-REU grant and 50% by a non-NSF research grant.

Name: Ares, Monica

Worked for more than 160 Hours: Yes

Contribution to Project:

Monica Ares worked under the direction of Jeff Andle in the Summer of 1998 and her research topic was 'Theory of Acoustic Plate Modes for Liquid Sensing.' She was supported 100% by the NSF-REU grant.

Name: Bailey, Christopher

Worked for more than 160 Hours: Yes

Contribution to Project:

Christopher Bailey worked under the direction of John Vetelino in the Summer of 1998 and his research topic was 'Thin Film Platinum Micro-Heaters and Resistance Temperature Detectors for Gas Sensors.' He was supported 50% by the NSF-REU grant and 50% by the Office of Naval Research (ONR).

Name: Costello, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Michael Costello worked under the direction of John Vetelino in the Summer of 1998 and his research topic was 'Temperature-Control Apparatus for Chemical Warfare Agent Detection Using a Temperature Programmed Surface Acoustic Wave Device.' He was supported 100% by the NSF-REU grant.

Name: Drazek, Russell

Worked for more than 160 Hours: Yes

Contribution to Project:

Russell Drazek worked under the direction of Fred Irons in the Summer of 1998 and his research topic was 'Texas Instruments Analog to Digital Converters Communications Laboratory Project.' He was supported 50% by the NSF-REU grant and 50% by a non-NSF research grant.

Name: McAvoy, Raymond

Worked for more than 160 Hours: Yes

Contribution to Project:

Raymond McAvoy worked under the direction of Donald Hummels in the Summer of 1998 and his research topic was 'Waveform Capturing Tools for Digital Signal Processing.' He was supported 50% by the NSF-REU grant and 50% by a non-NSF research grant.

Name: Meserve, Richard

Worked for more than 160 Hours: Yes

Contribution to Project:

Richard Meserve worked under the direction of Jeff Andle in the summer of 1998 and his research topic was 'The E-Smart Sensor Network.' He was supported 100% by BLODE, Inc.

Name: Moore, Latoya

Worked for more than 160 Hours: Yes

Contribution to Project:

Latoya Moore worked under the direction of John Vetelino in the Summer of 1998 and her research topic was 'Design, Fabrication and Testing of a Multi-gas Sensor Platform.' She was supported 100% by the NSF-REU grant.

Name: Morehouse, Rachel

Worked for more than 160 Hours: Yes

Contribution to Project:

Rachel Morehouse worked under the direction of John Vetelino in the Summer of 1998 and her research topic was 'Auger Electron Spectroscopy Depth Profiling System.' She was supported 40% by the NSF-REU grant and 60% by a federally funded work study program.

Name: Nalley, Chance

Worked for more than 160 Hours: Yes

Contribution to Project:

Chance Nalley worked under the direction of John Vetelino in the Summer of 1998 and his research topic was 'Application of Conductive Polymers in Sensor Devices.' He was supported 100% by the NSF-REU grant.

Name: Page, Curt

Worked for more than 160 Hours: Yes

Contribution to Project:

Curt Page worked under the direction of Robert Lad in the Summer of 1998 and his research topic was 'Gas Delivery System Applied to the Sensing of Volatile Organic Compounds.' He was supported 100% by the Office of Naval Research (ONR).

Name: Patterson, Joshua

Worked for more than 160 Hours: Yes

Contribution to Project:

Joshua Patterson worked under the direction of Mohamad Musavi in the Summer of 1998 and his research topic was 'Fuzzy Logic Systems for Base Calling in Automated DNA Sequencing.' He was supported 73% by the NSF-REU grant and 27% by a non-NSF research grant.

Name: Roshan, Huma

Worked for more than 160 Hours: Yes

Contribution to Project:

Huma Roshan worked under the direction of John Vetelino in the Summer of 1998 and her research topic was 'Development and Testing of a Thin Film Deposition System For Metallization and Coating of Dielectrics.' She was supported 100% by the NSF-REU grant.

Name: Saucier, Scott

Worked for more than 160 Hours: Yes

Contribution to Project:

Scott Saucier worked under the direction of Fred Irons in the Summer of 1998 and his research topic was 'Printed Circuit Board Layout for DAC Evaluation Board.' He was supported 50% by the NSF-REU grant and 50% by a non-NSF research grant.

Name: Service, Christopher

Worked for more than 160 Hours: Yes

Contribution to Project:

Christopher Service worked under the direction of John Vetelino in the Summer of 1998 and his research topic was 'Acoustic Loss Measurement of Silicon Nitride Thin Films on Quartz.' He was supported 100% by the NSF-REU grant.

Name: Slade, Wayne

Worked for more than 160 Hours: Yes

Contribution to Project:

Wayne Slade worked under the direction of Mohamad Musavi in the Summer of 1998 and his research topic was 'An Artificial Neural Network System for Automated DNA Base-calling.' He was supported 100% by a non-NSF research grant.

Name: Stamm, Jeffrey

Worked for more than 160 Hours: Yes

Contribution to Project:

Jeffrey Stamm worked under the direction of Robert Lad in the Summer of 1998 and his research topic was 'AC Impedance Measurements of Tungsten Trioxide Thin Film Sensors.' He was supported 100% by the Office of Naval Research (ONR).

Name: Thomas, Nazareth

Worked for more than 160 Hours: Yes

Contribution to Project:

Nazareth Thomas worked under the direction of Bruce Segee in the Summer of 1998 and his research topic was 'Using IEC Languages on a PLC to Model an Industrial Process.' He was supported 100% by the NSF-REU grant.

Technician, Programmer**Other Participant****Research Experience for Undergraduates****Organizational Partners****BIODE, Inc.**

BIODE, Inc. is a small business which incubated from the University of Maine. The chief engineer at BIODE is Jeffrey Andle, a former NSF-REU participant in the summer of 1981. Several NSF-REU students received financial support and guidance from engineers at the BIODE Corporation. They also utilized BIODE facilities.

SRD Engineering Inc

Sensor Research and Development (SRD) is a small business which incubated from the University of Maine. Several NSF-REU students received financial support and guidance from engineers at SRD. They also utilized SRD facilities.

Other Collaborators or Contacts

Collaborations and contacts have occurred with the following organizations:

Sandia National Laboratories, Albuquerque, NM
 SAWTEK Inc., Orlando, FL,
 Marquette University, Milwaukee, WI
 South Dakota State University, Brookings, SD
 National Semiconductor, South Portland, ME
 Fairchild Semiconductor, South Portland, ME

Faculty in the Departments of Chemistry, Physics, Chemical Engineering, Food Sciences and Microbiology.

Activities and Findings

Research and Education Activities: (See PDF version submitted by PI at the end of the report)

The NSF-REU program as outlined in the original proposal proceeded in a very coherent fashion throughout. A total of 60 students which included ten women and eleven minority and four handicapped students participated in the program. Each participant chose his/her research topic and supervisor and was given preliminary reading material prior to the onset of the program. The project director held informal discussions with each participant and his/her research supervisor periodically throughout the duration of the program. Each participant kept a notebook of his/her activities which enabled other people in his/her research area to benefit from the work. At the end of the program each participant submitted a final report to the project director. The titles of the NSF-REU reports summarized in Table 1 clearly illustrates the wide variety of NSF-REU student projects. In the academic semester following the program each participant also presented an oral seminar to interested faculty and students. All the on-campus NSF-REU students were required to attend each seminar and participate in the discussion period following the seminar. All of the seminars had excellent attendance. The students were graded on the basis of their day to day performance and development during the summer, their seminar presentation and their final report. The grade was determined by the project director and the student's research supervisor. The students benefited not only from the research experience but also from the technical writing and speaking required in the program.

The research atmosphere to which the NSF-REU students were exposed in the summer was not truncated at the end of the summer. All of the on-campus participants are continuing their work into the academic year. Some of the students are receiving compensation from either departmental funds or research contracts to continue their research on a part-time basis, while other students are continuing their work in the framework of the University Honors Program. The project director has contacted the advisors of the off-campus students resulting in several off-campus students continuing their work in an appropriate research group.

The project director and other faculty members participating in the NSF-REU program believe the research and educational experience gained by the students during the summer and further experience to be gained during the academic year to be an integral part of the students' education. In this light, the project director is continuing to monitor the progress of the participants throughout the academic year.

Findings: (See PDF version submitted by PI at the end of the report)

Training and Development:

See Activities and Findings Section

Outreach Activities:

In addition to presenting seminars which were open to the public on their NSF-REU projects, several NSF-REU students gave presentations at local high schools. In these presentations students described the positive effect of the program on their educational development. After the presentation they met with students in an informal basis and answered questions. These high school presentations have helped the University to recruit more students into engineering. Finally, it has also helped to increase the number of females enrolling in engineering programs.

Journal Publications

Fern*, A., M.T. Musavi, and J. Miranda, "Automatic Extraction of Drainage Networks from Digital Elevation Data: A Neural Network Approach", IEEE Transactions on Geoscience and Remote Sensing, p. 1007, vol. 36 No 3, (1998). Published,

Haskell*, R.B., Caron, J.J., Benoit*, P. and Vetelino, J., "A Surface Acoustic Wave Mercury Vapor Sensor", IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, p. 1393, vol. 45 No 5, (1998). Published,

Munson*, J., Roderick*, R., Andle, J., French, L.A., Schweyer, M.G., Watson, C., Foley, J., Bruce, A., Bruce, M. and Vetelino, J., "Electromechanical Piezoelectric Sensors for Trace Ionic Contaminants", IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, p. 1408, vol. 45 No 5, (1998). Published,

Allen*, B., Caron, J.J., Andle, J.C., Galipeau, J.D., and Vetelino, J., "Temperature Stable Piezoelectric Substrates for Surface Acoustic Wave Gas Sensors", Sensors and Actuators B, p. 141, vol. B-35, (1997). Published,

Fern*, A. and Musavi, M., "Dynamic System Identification Using Multiresolution Networks of Local Units", IEEE Transactions on Neural Networks, p. , vol. , (). Submitted,

Cookson*, S. and Lad, R., "Structure and Properties of Compositionally Graded Aluminum Oxynitride Thin Films", J. Vac. Sci. Technology A, p. , vol. , (). Submitted,

Kovaka*, M., and Kleban, P., "Microstructural Effects on the Friction and Wear of ZrO₂ Films", WEAR, p. , vol. , (). Submitted,

Books or Other One-time Publications

Allen*, B. and Vetelino, J., "Piezoelectric Substrates for Surface Acoustic Wave Gas Sensors", (1996). Proceedings, Published
Bibliography: Sixth International Meeting on Chemical Sensors, National Institute of Standards and Technology, Gaithersburg, MD, July 22-25, 1996

Fern*, A., Miranda, J., Coughlin, D. and Musavi, M., "Pulp Digester Level Prediction Using Multiresolution Networks of Locally Active Units", (1997). Proceedings, Published
Editor(s): IEEE
Bibliography: International Conference on Neural Networks

Fern*, A., Miranda, J. and Musavi, M., "Automatic Extraction of Drainage Networks from Digital Terrain Elevation Data: A Local Network Approach", (1997). Proceedings, Published
Editor(s): IEEE
Bibliography: Proceedings of International Conference on Neural Networks, June 9-12, 1997, Houston, TX

Kenny*, T., Caron, J.J., Legore, L.J., Libby, D.G., Freeman, C.J. and Vetelino, J., "A Surface Acoustic Wave Nitric Oxide Sensor", (1997). Proceedings, Published
Editor(s): IEEE
Bibliography: 1997 Frequency Control Symposium, May 28-30, 1997, Orlando, FL

Haskell*, R.B., Caron, J.J., Libby, D.G., Benoit*, P., Freeman, C.J. and Vetelino, J., "A Surface Acoustic Wave Mercury Vapor Sensor", (1997). Proceedings, Published
Editor(s): IEEE
Bibliography: 1997 Frequency Control Symposium, May 1997, Orlando, FL

Munson*, J., Andle, J., Roderick*, R., French, L.A., Schweyer, M.G., Watson, C., Foley, J., Bruce, A., Bruce, M. and Vetelino, J., "Electrochemical Piezoelectric Sensors for Trace Ionic Contaminants", (1997). Book, Published
Bibliography: 1997 Sensors and Transducers Conference, Chicago, ILL

Munson, J., Roderick*, R., and Andle, J., "Piezoelectric Sensor Platform and Differential Frequency Counter for Fluid Phase Sensing Applications", (1997). Proceedings, Published
Editor(s): ASEE
Bibliography: 1997 American Society of Electrical Engineers (ASEE) Conference, April 25-26, 1997, West Point, NY

Doogue*, M. and Frankel, D., "Vacuum and Controlled Atmosphere Hall Effect Measurements on WO₃ Films", (1997). Proceedings, Published

Editor(s): Materials Research Society

Bibliography: Materials Research Society 1997 Fall Meeting, Boston, MA

Benoit*, P., and Vetelino, J., "A Surface Acoustic Wave Sensor for Heavy Metals", (1998). Proceedings, Published

Bibliography: International Conference on Chemical Sensors, Beijing, China, July, 1998

Pringle*, LeKisha, and Kleban, P., "New Mechanisms for Spillover Chemistry: Gold Catalyzed Reduction of WO₃", (1998). Proceedings, Published

Bibliography: International Conference on Chemical Sensors, Beijing, China, July, 1998

Kenny*, T.D., Marquis, B.T., and Vetelino, J.F., "A Nitric Oxide and Ammonia Sensor for Fossil Fuel Combustion Control", (1998). Proceedings, Published

Editor(s): WTQA '98

Bibliography: 98' 14th Annual Waste Testing and Quality Assurance Symposium, Arlington, VA, July 13-15, 1998

Amos*, M., and Segee, B.E., "Artificial Neural Networks Using Microsoft Excel for Windows 95", (1997). Proceedings, Accepted

Editor(s): ASEE

Bibliography: Proceedings ASEE 97

Fern*, A., Coughlin, D., and Musavi, M.T., "Paper Industry: System Identification and Modeling", (1999). Book, Published

Editor(s): John Webster

Collection: Encyclopedia of Electrical and Electronic Engineers

Bibliography: John Wiley & Sons

Kelso*, G, Irons, F.H., and Hummels, D.M., "Fast Compensation of Analog to Digital Converters", (1997). Proceedings, Published

Editor(s): IEEE

Bibliography: International Instrumentation and Measurement Technology Conference (IMTC99), Venice, Italy, June 1997

Web/Internet Site

URL(s):

<http://www.eece.maine.edu/URP/>

Description:

Other Specific Products

Contributions

Contributions within Discipline:

The NSF-REU program has contributed to the undergraduate curriculum and departmental research. The NSF-REU program has resulted in the development of an undergraduate course called Undergraduate Research Participation. Students receive three credits for their participation and the course is used by the students as a technical elective. The research done by NSF-REU students has helped ongoing research in the department and also enabled faculty to initiate new research directions.

Contributions to Other Disciplines:

Some of the NSF-REU students came from science and engineering disciplines other than electrical engineering. The undergraduate research participation course is given an interdisciplinary connotation and is called IDL 398. Non electrical engineering students can take this course to satisfy their departmental requirements. Some of the research performed in the NSF-REU program is interdisciplinary and involves diverse disciplines such as physics, chemistry, microbiology and food science. The NSF-REU student research has helped the research effort in each of these disciplines.

Contributions to Human Resource Development:

The NSF-REU project has helped to increase student enrollment at several levels. First, it has exposed students to research thereby motivating many students to pursue M.S. and Ph.D. degrees. Second, the availability of the program has caused students who did not participate in the NSF-REU program to work hard to improve their grades. Some of these students were then chosen in the following year for NSF-REU participation and subsequent graduate work. Finally, presentations by NSF-REU students in local high schools has caused an increase in student enrollment in engineering, particularly in women.

Contributions to Resources for Research and Education:

Contributions to research and education resources have been described earlier.

Contributions Beyond Science and Engineering:

Several NSF-REU students were involved in research projects which were suggested by local industry. In fact several students were advised by adjunct faculty who were engineers from local industry. The work of the NSF-REU students has helped two local small businesses, namely, Sensor Research and Development Corporation (SRD) and BIODE Corporation to expand their research in new directions. This has resulted in Small Business Innovation Research (SBIR) grants for these businesses, therefore clearly demonstrating that properly advised undergraduates can impact local economic development.

Categories for which nothing is reported:

Any Product

PROJECT ACTIVITIES AND FINDINGS

Major Findings

The NSF-REU program has had a noticeable effect on the undergraduate curriculum. The NSF-REU participants were awarded three academic credits for their participation in the program. They will be able to use these credits toward their B.S. degree. Students who continue their research project in the framework of the University Honors Program will receive additional academic credit. This program along with previous NSF-URP and NSF-REU programs have also had an indirect effect on the Electrical and Computer Engineering Department's acquisition of useful excess equipment. National Semiconductor Corporation in Portland, Maine and Digital Equipment Corporation have viewed with enthusiasm the expanding graduate program along with the research atmosphere being instituted on the undergraduate level in the Electrical and Computer Engineering Department. Owing in part to these factors, they have donated a large amount of equipment to the Department. In terms of the undergraduate curriculum, it will no doubt have a significant effect on the present sequence of courses in the area of solid state, electronics and computer engineering.

The research projects of faculty members involved in the NSF-REU program benefited in terms of the results of the research of the participants during the summer. Some of the projects will continue to benefit during the academic year since many of the students are continuing their research. Each of the involved faculty members expressed to the project director their personal enjoyment for the opportunity to work with highly qualified undergraduate students. The work of previous NSF-URP students has been extremely valuable to research at the University of Maine. The value of the contributions of these students is indicated by the numerous publications in which NSF-REU students were co-authors.

The NSF-REU program has provided a valuable boost to the student's motivation toward both present and future graduate study. It has given them the opportunity to apply advanced techniques in mathematics, physics and engineering as well as demonstrating the need for further course work to provide the necessary tools for more advanced research. The program has also caused some of the students to modify their ultimate educational goals. It has further demonstrated that highly qualified undergraduate students are capable of doing high-quality advanced work. The project director also believes that the program has had a very positive effect on the student body in general. Most of the student applicants who were not chosen voiced the opinion that the program offered an excellent opportunity for advanced study. Several others stated a genuine desire to plan for the opportunity next year. This means a deliberate attempt to improve grades (to qualify) and therefore should have a healthy effect upon the student body in general.

The NSF-REU program has made many faculty realize that undergraduates can indeed make very positive contributions in research. The project director has received many e-mails, telephone calls and letters requesting further information concerning the NSF-REU program at Maine.

In conclusion, I would rate the recent NSF-REU program as being an outstanding success which has given both the student and University an excellent experience in both research and teaching. The project itself and the ensuing seminars caused many fruitful discussions and suggestions with regard to the various research projects. The opportunities for these discussions and suggestions would have perhaps not been possible if not for the unifying nature of the NSF-REU program. The publications and conference presentations and student reports attest to the high level of performance achieved in the program.

This program and previous NSF-URP and NSF-REU programs conducted at the University of Maine have been extremely vital to the education of bright undergraduate students and has guided many to advanced degrees. It has also provided an opportunity for women, minorities and handicapped students to experience research. This has motivated several students in these under represented groups to pursue advanced degrees.

Table 1. NSF-REU REPORT TITLES 1996-1998

Title NSF-REU Report	NSF-REU Participant	Year
Development of a Hall Effect Measurement System for the Thin Film Synthesis and Processing Facility at the University of Maine	Bejamin Allen	1996
Artificial Neural Networks Using Microsoft Excel for Windows 95	Michael Amos	1996
Event-Driven Data Acquisition Software	Ryan Crowley	1996
Non-Linear Dynamic System Identification Using Multiresolution Networks of Locally Active Units	Alan Fern	1996
Surface Acoustic Wave for the Detection of Mercury Vapor	Reichl Haskell	1996
A Java Based Multimedia Power Plant Simulator	Julie Johnson and James Olcott	1996
Simulation of Current Steering Sigma-Delta Analog-to-Digital	Gina Kelso	1996
Ruthenium Doped Tungsten Trioxide for the Detection of Nitric Oxide	Thomas Kenny	1996
Investigation of Labview for Data Acquisition, Instrument Control and Data Analysis	Michael Ketch	1996
Sensor Platform for Aqueous Mercury Sensing	Justin Munson	1996
Analysis and Enhancement of a Neural Network Approach to Drainage Networks	Owen Ozier	1996
Visual Processing Using Windows 95	Seth Pouwels	1996
Theory, Design, and Implementation of a Digital Comb Filter	Monica Puri	1996
An Analog Microheater Controller	Christopher Qualey	1996
Differential Counter	Ryan Roderick	1996
C Implementation of Real-Time Systems	Diana Snow	1996
Solid State Sensor Microprocessor Control and Networking	Jason Syversen	1996
FTIR Spectroscopy	Kevin Tibbetts	1996
Cryopump Regeneration Control Unit (CRCU)	Robert Tukey	1996
Investigation of Temperature Induced Phase Transitions in Polymers Using a Surface Acoustic Wave Device	Norman Webb	1996
Artificial Neural Network OLE Controls for Windows 95	Michael Amos	1997

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Title NSF-REU Report	NSF-REU Participant	Year
Data Acquisition Using the HP4195A Network Spectrum Analyzer via the World Wide Web	Jeremy Bell	1997
Effects of Film Thickness and Operating Temperature on a Surface Acoustic Wave Mercury Vapor Sensor	Patrick Benoit	1997
Activation of Chemical Reactions in Gas Sensors Using Ultra-Violet Light	Pablo Brissette	1997
Atomic Force Microscope Analysis of Ceramic Thin Film Materials	Scott Cookson	1997
Acoustic Plate Mode Sensor Control Platform	Ryan Crowley and Jason Syversen	1997
Vacuum and Controlled Atmosphere Hall Effect Measurements on Epitaxial WO ₃ Thin-Films	Michael Doogue	1997
Two-Film Gas Sensor	David Gahriss	1997
Fabrication and Characterization of Sharp Probes for Studies of Mechanical Properties at the Nanometer Scale	Dale Goodwine	1997
Instrumentation Using MEX-FILES	Casey Henderson	1997
A Chemiresistive Sensor for the Detection of Gaseous HC1	Thomas Kenny	1997
Determining the Mechanisms of Oxide Thin Film Growth: Theoretical Modeling of Diffusion Processes	Molly Kovaka	1997
Frequency Characterization of WO ₃ Films for Gas Sensing Applications	Jeffery Lenfest	1997
The Complete Installation and Troubleshooting of a Thin Film Metal Vacuum Deposition System	Jason Ouellette	1997
Automatic Feature Extraction from Digital Terrain Elevation Data	Andrew Piper	1997
Quantitative Analysis of an Oxide Thin Film Using the X-ray Photoelectron Spectrometer	LeKisha Pringle	1997
Distributed Instrumentation Information via the World Wide Web	Derrick Slopey	1997
Cryopump Regeneration Control Unit (CRCU)	Robert Tukey	1997
Error Modeling of Narrow Band Nonlinear Network Functions	Raymond Vought	1997
Theory of Acoustic Plate Mode Sensors	Monica Ares	1998
Thin Film Platinum Micro-Heaters and Resistance Temperature Detectors for Gas Sensors	Christopher Bailey	1998

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Title NSF-REU Report	NSF-REU Participant	Year
Temperature-Control Apparatus for Chemical Warfare Agent Detection Using a Temperature Programmed Surface Acoustic Wave Device	Michael Costello	1998
Texas Instruments Analog to Digital Converters Communications Laboratory Project	Russell Drazek	1998
Nitric Oxide, Viagra, and Lung Disease	Thomas Kenny	1998
Waveform Capturing Tools for Digital Signal Processing	Raymond McAvoy	1998
The E-Smart Sensor Network	Richard Meserve	1998
A Gas Delivery Package for a Chemiresistive Sensor	Latoya Moore	1998
Auger Electron Spectroscopy Depth Profiling System	Rachel Morehouse	1998
The Use of Polymers and Conductive Polymeric Materials for Gas Sensing, Particularly Chemical and Biological Warfare Agents	Chance Nalley	1998
Gas Delivery System Applied to Sensing of Volatile Organic Compounds	Curt Page	1998
Fuzzy Logic Systems for Base Calling in Automated DNA Sequencing	Joshua Patterson	1998
Development and Testing of a Thin Film Deposition System for Metallization and Coating of Dielectrics	Huma Roshan	1998
Printed Circuit Board Layout Project	Scott Saucier	1998
Acoustic Loss Measurement of Silicon Nitride Thin Films on Quartz	Christopher Service	1998
An Artificial Neural Network System for Automated DNA Base-calling	Wayne Slade	1998
Intelligent Simulation of Data Gathering in a Factory Setting	Derrick Slopey	1998
AC Impedance Measurements of Tungsten Trioxide Thin Film Sensors	Jeffrey Stamm	1998
Using IEC Languages on a PLC to Model an Industrial Process	Nazareth Thomas	1998