



Oklahoma Center for the Advancement of Science and Technology

PROGRAM SUMMARY

January 1, 2009

**OKLAHOMA APPLIED RESEARCH SUPPORT
OARS R&D Faculty and Student Intern Partnerships**

An investment in R&D with human capital.....in the present.....for the future.

Program Description

R&D Faculty and Student Intern Partnerships program awards have been made to 23 Oklahoma firms as well as to 16 2-, 3-, and 4-year colleges and universities. Undergraduate students and faculty members who teach undergraduate students have interned at more than 100 Oklahoma firms and farms. More than \$3.3 M has been committed from FY98 through FY07 by OCAST from state appropriated funds. In this win-win program the host research sites provide an equal amount of support and they receive assistance from Oklahoma college students with R&D efforts leading to new products, processes, or services. The high-tech projects cover areas of importance to the Oklahoma economy.

The R&D Intern Partnerships program has (1) increased the pool of scientists and engineers available to Oklahoma industry, (2) encouraged students to be scientists and engineers and (3) enhanced the classroom experience for undergraduate students by having a faculty member with current awareness of industry needs. Undergraduate interns may be from a support area related to building successful Oklahoma high-tech companies.

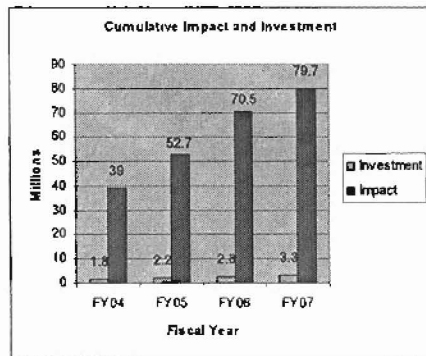
The projects have five common features.

- (1) An Oklahoma business, Oklahoma college or Oklahoma university must be the fiscal agent.
- (2) An equal match of the OCAST funds from nonstate appropriated funds is required.
- (3) The research must be performed in an applied research facility - located at a firm, a non-profit research institute, or an institution of higher education that is incubating a company. The mentor is from industry or is an academic with documented success record of industrial applied research.
- (4) An Oklahoma firm or farm must benefit from the research.
- (5) Submitting a proposal does not guarantee funding. Each proposal is evaluated by a team of proposal reviewers and the applicant receives a copy of the reviewer comments. A majority of the project proposal reviewers are from outside of Oklahoma and have a background in industry, academia, and government research.

The award may be for one or two years. Almost all of the programs have interns working in an Oklahoma industrial laboratory on an applied research project with a company mentor. The firm provides half of the intern's salary and fringe benefits as the required match and OCAST provides half of the intern's salary and fringe benefits. The reviewers have shown a preference for the programs in which at least 75% of the total funds (OCAST plus Match) go directly to the interns as salary and

fringe benefits. The remaining support is most often academic Principal Investigator salary and fringe benefits as well as supplies to run the program, but in general not research supplies.

The Internship support comes from the Oklahoma Applied Research Support (OARS) program that does not support market surveys and related activities, training or technical assistance for business firms, or research that lacks the potential for reasonably short-term commercialization.



Program Impact

The faculty and student interns come from rural and urban colleges and they intern throughout Oklahoma. Through this program the interns learn first-hand about the many outstanding high-tech employment opportunities in Oklahoma. This program is helping companies and helping reduce the “brain-drain” from Oklahoma.

The program has impacted people as well as Oklahoma with direct financial impacts to businesses in several categories including jobs retained or created, equipment added, productivity, and sales of \$79.7 million through FY-07.

interns have gained employment as well as continued their college education. Intern and Principal Investigator quotes speak well of the program meeting its’ goals. “Before the experience of the internship, I was not sure if I would continue my education past a bachelor’s degree. My internship at the Kerr-McGee Technical Center helped me to focus on continuing my education and pursuing a doctorate degree.” “Without OCAST I would not have had this opportunity.” “His ‘intern team’ so impressed the [company] they moved him into the full development team.” “[The intern’s] experience enabled him to start a business on the side.”

Program Impacts – OARS R&D Internships (Impacts are tracked for 5 Years)			
488 Internships served since 1998	FY05	FY06	FY07
Active Interns	57	75	52
Interns (or former) completing original degree plan	83	130	260
Interns (or former) continuing original degree plan	30	45	49
Interns (or former) working towards an additional degree	51	64	135
Interns (or former) employed in a technical career	52	106	80
Interns (or former) employed in an Oklahoma technical career	48	79	53

The OCAST R&D Faculty and Student Intern Partnership program has received national recognition. The program was identified as a flagship model for improving the technology-based work force in *A Governor’s Guide to Building State Science and Technology Capacity* in a study published by the National Governors Association, 2002. The program was named “Innovator” in *Inventing the Knowledge Economy (2001)*, *Human Capital Strategies for the Next Economy – Best Practices in the South (2002)*, *Summit on the Rural South (2005)* by the Southern Growth Policies Board. The National Conference of State Legislatures highlighted the program in a study for the Oklahoma Legislature. The program was also named an Innovator at the 2006 *The Journal Record Innovator of the Year* ceremony.

The OCAST R&D intern partnership program was honored with a regional Innovator Award recognizing innovative rural programs at the Southern Growth Policies Board annual meeting held June 2005 at Point Clear, Alabama. This award recognizes the achievements of the interns, the college faculty, and the industry mentors who are the people that have built this program. Michelle McFarland, OCAST Review Team Leader, and Arnulf Hagen, R&D Intern Partnerships Coordinator (Contractor) receiving the award from Alabama Governor Bob Riley (Center).



Internship Awards

The University of Tulsa –Tulsa – \$60,000 (2 years: January 2009), \$57,978 (2 years: May 2006)

Dr. Surendra Singh leads the “Design and Development of Electric Submersible Pump” internship program at Centerlift – A Division of Baker Hughes (Claremore). Under the direction of company mentors the students will be engaged in the design and development of electric submersible pump components including electric downhole motors, seal sections, gas separators, and gages for monitoring downhole conditions. The interns will have an active role in all phases of the project including design, development, and testing of these components. This experience will provide learning and acquiring valuable engineering as well as work place interpersonal skills. The company has provided the matching funds.

Dr. Surendra Singh, also led the “Design and Development of Electric Submersible Pumps” internship at Centerlift. The research project involved the design, development and testing of a Graphical Control System Electrospeed Variable Speed Drive and the design of pump parts for an Electrical Submersible Pump. The company provided an equal match of the OCAST award.

True Digital Security –Tulsa – \$59,140 (2 years: January 2009)

Dr. Jerald Dawkins of True Digital Security (Tulsa) will lead the “Network Flow Analysis” internship program. The interns will gain real-world experience in security evaluation and in software development processes. This opportunity will extend the students' knowledge and experience beyond the classroom. The interns will work on further developing a critical component to TRUE's analytical capabilities, Network Flow Analysis. Core areas for the intern's research include network flow analysis, protocol detection, anomalous behavior, statistical analysis, database scalability, data visualization, and clustering technologies. The company has provided the matching funds.

The University of Tulsa –Tulsa – \$22,659 (1 year: January 2009)

Dr. Kaveh Ashenayi (Tulsa University) and co-PI Mr. Steve Berge lead the “Development of Plan for an Optimized Production Process” internship program at Larbarger, Inc. (Tulsa). Steve Berge leads the company mentoring team. The interns will assist in optimizing the production process for high end printed circuit cards. The interns will study a process, interview operators, collect data, develop flowcharts, and make improvement recommendations including implementation of some of the action items. The interns will become familiar and work with Western Data Systems software, Root cause analysis and 8-D problem solving. The company has provided the matching funds.

The University of Tulsa –Tulsa – \$54,343 (2 years: January 2009)

Dr. Jeremy Daily of Tulsa University leads the internship program “Forensic Verification of Automobile Data “ at Avansic, Inc. (Tulsa). The interns will work under the direction of Dr. Gavin Manes in the field of traffic crash reconstruction and digital forensics. The interns will identify and explore data that comes from vehicles such as air bag monitors, global positioning systems, antilock braking sensors, electronic stability controls, rollover sensors, and tire pressure monitoring devices. These data sets will enable a better understanding of events that occur before, during, and after crashes. The company has provided the matching funds.

Strategic Solutions International, LLC (Stillwater) – Stillwater – \$60,000 (2 years: January 2009)

Dr. Steve Trost will lead the “SSI Applied Research Program for Undergraduate Interns” as well as mentor interns. The interns will work on the refinement of a wireless sensor configured as a livestock health monitoring system. This technology will then be adapted to additional industries and applications such as, home temperature automation, shipping container monitoring, and construction quality control. This multidisciplinary internship program will have students from computer science, mechanical engineering, and electrical engineering. The company has provided the matching funds.

Oklahoma State University – Stillwater – \$60,000 (2 years: June 2008)

Dr. Jay Hanan will lead the “Advanced Sensors for Non-destructive Testing on Wings” internship program at Veracity Technology Solutions (Tulsa). The intern team will work on a project to add new sensors to a prototype non-destructive analysis used in the maintenance of military aircraft. In addition they will help to update control

software for new and existing sensors. In addition to the technical work the interns will have the opportunity to experience the business side of R&D.

The University of Tulsa –Tulsa – \$60,000 (2 years: June 2008), \$57,978 (2 years: May 2006)

Dr. Surendra Singh leads the "Design and Development of Railroad Signal Sensors" internship program. The research project at Railroad Signal International in Tulsa involves the design, development and testing of railroad signaling system that includes LED highway crossing lights, surge protection panels, controller application software and battery chargers. The interns under the guidance of company mentors will be involved in all phases of the engineering design, specifications, development, testing and manufacturing of the system. The experience gained will provide the interns with job opportunities in electrical and railroad industry in Oklahoma. Railroad Signal International will be providing an equal match to the award.

Dr. Singh and Martin Castro, Maria Rocha, and John Whisman of Railroad Signal International led the "Design and Development of Railroad Signaling System" internship program at Railroad Signal International of Tulsa. The project involved the design, development and testing of an electronic controlled railroad signaling system that included a crossing lamp controller, a surge protection panel, gate arm lights, and a battery charger.

The University of Tulsa –Tulsa – \$60,000 (2 years: January 2008)

Dr. Surendra Singh leads the "Design and Development of Intrusion Sensors" internship program. The interns will work on the design and development of crystal and acoustic synthesizers as well as receiver circuit board redesign at. The interns will take an active role in all phases of the project enabling them to learn and acquire valuable engineering and interpersonal skills. Qual-Tron, Inc. will be providing an equal match to the award.

Oklahoma City Community College – Oklahoma City – \$34,272 (2 years: January 2008)

Dr. Fabiola Janiak-Spens director of the Biotechnology program at OCCC will have interns conducting research at Analytical Research Laboratories, DNA Solutions, Cytovance Biologics, Federal Aviation Administration, Intergenetics, and Riley Genomics in Oklahoma City as well as Immuno-Mycologics in Norman under the direction of company mentors. The internship project provides biotechnology students with a broad range of applied biomedical research and development. The areas of research include: 1) developing biomarkers for factors that are of interest in aerospace medicine, 2) diagnostic service for rheumatological diseases, 3) biomanufacturing in an FDA approved setting. The companies will be providing an equal match to the award.

Martin Bionics – Oklahoma City \$60,000 (2 years: January 2008) \$60,000 (2 years: May 2006)

Joel Schulz leads the "Striding Toward the Future in Advanced Prosthetics" internship program at Martin Bionics, Inc.. The interns will work on the investigation of anatomical joint behaviors during daily activities, and develop models for dampers, advanced circuits, and prototypes. This particular project will allow student interns to help the company stretch the design to include aspects of neural integration, haptic feedback, multi-joint simultaneous control, and other far reaching qualities. The company will be providing an equal match to the award.

Mr. Jay Martin and Mr. Joel Schulz of Martin Bionics led the earlier "Revolutionizing Prosthetics" internship program. The interns worked on development activities related to a socket system involving a novel gel-liner, a state-changing socket, and a vacuum system enabled to monitor changes of the socket environment. This program was partially supported by the Oklahoma EPSCoR program.

Western Oklahoma State College – Altus – \$49,900 (2 years: January 2008)

Elizabeth Wallace leads the "Reducing Input Costs With Variable Rate Applications" internship program where the interns will investigate the use of variable rate technology to increase efficiency of the cotton crop harvest aid applications at the Southwest Research and Extension Center. GreenSeeker technology will be used to build application programs for harvest aid application. The SWREC will be providing an equal match to the award.

IMTEC – Ardmore – \$13,628 (1 year: January 2008)

Dr. Mauricio Sanchez leads the "IMTEC-UCO Engineering R&D Intern Program". The interns will work on a broad range of applied biomedical research and manufacturing development. The students will apply different

technologies in the creation and improvement of dental implants. The company will be providing an equal match to the award.

AvPro, Inc. – Norman – \$30,000 (2 years: January 2008)

Thomas Rose leads the "Material State Management for Process Control" internship where the students will receive hands on experience in the unique field of composite materials. During the research the interns will help standardize the manufacturing and testing of composite materials. The company will be providing an equal match to the award.

Amethyst Research, Inc. – Ardmore – \$13,430 (1 year: January 2008)

Dr. T.D. Golding leads the "Semiconductor Fabrication and Process Development" internship program that will provide the student intern real-world experience in identifying and meeting many milestones involved in transforming R&D efforts into revenue generating consumer product. The intern will acquire valuable skills through materials suppliers, logistic channels, manufacturing process flow, and documentation requirements. The company will be providing an equal match to the award.

ICx Nomadics, Inc. – Oklahoma City and Stillwater – \$52,340 (2 years: May 2007) \$59,640 (2 years: January 2006)

Mr. Tom Jobe, Program Manager, will guide the program and mentor interns. The internship research will focus on biochemistry, software engineering, and electrical engineering. In the first project the team will research the development of Surface Plasmon Resonance (SPR) surface-attachment chemistries and procedures for the measurement of specific target analytes. For the second project the interns will assist in developing biosensors with greater sensitivity for the company's SensiQ product line. This program is partially supported by the Oklahoma EPSCoR program.

The University of Tulsa – Tulsa – \$34,800 (2 years: May 2007)

Dr. William Potter leads the "Advanced Applications of EPA-registered Algaecide" internship program at Winston Company, Inc in Tulsa. The interns will work on projects under the direction of company mentors investigating the efficacy of the active ingredient in an algaecide product against new pests on a variety of substrates. Winston Company will be providing an equal match to the award.

Southeastern Oklahoma State University – Durant – \$ 26,568 (2 years: May 2007) \$28,314 (2 years: May 2005), \$11,589 (12 month Supplement: April 2004), \$23,178 (2 years: May 2002)

Interns working at the USDA South Central Agricultural Research Lab at Lane Oklahoma are studying the extraction of carotenoids from watermelons under the direction of Dr. Penelope Perkins-Veazie, Senior Research Scientist. The interns will participate in research to investigate the health-protecting qualities of organically-grown Oklahoma vegetables. The research will advance the field of plant physiology, create new markets for Oklahoma watermelons, and directly benefit Sugar Creek Seed, Inc. of Hinton. Dr. Stanley Rice of Southeastern Oklahoma State University will manage the project and monitor intern performance.

The University of Tulsa – Tulsa – \$17,775 (1 year: May 2007)

Dr. William Potter leads the "Automotive Catalysts: Optimization and Rheology Studies" internship program at Delphi Catalyst in Catoosa. The interns will work with two groups under the direction of company mentors at Delphi Catalyst to help develop a process to create an improved catalyst coater and the optimization of noble metals in automotive catalysts. Delphi Catalyst will be providing an equal match to the award.

DESA Research, LLC – Tulsa – \$58,164 (2 years: May 2007)

Dr. Jerald Dawkins, DESA Research, LLC, leads the "Secure Auditable Business Information Exchange" internship program at DESA Research, LLC in Tulsa. The interns will assist in designing and developing a new encryption-based email service that will integrate into existing email programs. DESA Research will be providing an equal match to the award.

The University of Tulsa – Tulsa - \$60,000 (2 years: May 2007)

Dr. Surendra Singh, University of Tulsa, leads the "Design and Development of Combustion Control Systems" internship program at John Zink Co. in Tulsa. The Interns will work with teams at the company in developing several low nitrogen oxide and ultra-low nitrogen oxide boilers used in refinery, petrochemical, and commercial applications. John Zink Co. will be providing an equal match to the award.

The University of Tulsa – Tulsa - \$59,185 (2 years: May 2007)

Dr. Kaveh Ashenayi, University of Tulsa, lead the "Crystalline Transducer with Temperature Sensor" internship program at GRC Amerada Gauges in Tulsa. The interns will work on developing and testing a temperature sensor to be placed on a pressure sensor used to measure bottom hole pressure at oil and gas wells. GRC Amerada Gauges will be providing an equal match to the award.

Completed Internship Programs

Southeastern Oklahoma State University – Durant – 53,472 (2 years: January 2007)

Dr. Nancy Paiva, Southeastern Oklahoma State University and Mr. Jimmy Stephens of Earth Biofuels, Inc. led the "Investigation of Biofuels Production Parameters" internship program at Earth Biofuels, Inc. in Durant. The interns worked on projects related to the commercial conversion of vegetable oils to high quality fuels.

The University of Tulsa – Tulsa – \$20,000 (1 year: January 2007)

Dr. Surendra Singh, University of Tulsa with Qual-Tron, Inc. led the "Design and Development of Intrusion Sensors" internship program at Qual-Tron, Inc in Tulsa. The interns worked on the the design, deveelopment and testing of a Crystal Synthesizer and Acoustic Sensor.

Riley Genomics – Oklahoma City – \$58,500 (2 years: January 2007)

Dr. Michael Centola, Riley Genomics led the "Rigen's Biotechnology Internship Training Program" internship program. The interns had the opportunity to work in one of the following areas: 1) robotics, 2) biomarker discovery, 3) bioinformatics, 4) processing science, and 5) clinical research.

Weather Decision Technologies – Norman- \$58,800 (2 years: January 2007)

Mr. DeWayne Mitchell, Weather Decision Technologies led the "Development of Weather Monitoring Products/System In GIS" internship program. The interns assisted with developing geographic information systems (GIS) capabilities which included building map layer databases, construcing GIS products and building GIS display systems.

The University of Tulsa – Tulsa – \$18,571 (1 year: January 2007)

Dr. Theodore Manikas, University of Tulsa with Geophysical Research Co., led the "Hybrid Circuit Design for Oil and Gas Well Gauges" internship program at Geophysical Research Co. in Tulsa. The interns developed and tested a hybrid circuit design that will be used in pressure and temperature gauges for oil and gas well production.

Southwestern Oklahoma State University – Weatherford – \$58,190 (2 years: May 2006)

Dr. Harpal Dhillon, Southwestern Oklahoma State University and Mr. Dean Bortell of CDF Associates, Inc. led the "Research for Medical Information Services" internship program at CDF Associates, Inc. in Weatherford. The interns used C# and designed applications in the .NET environment for health care domain activities.

Redlands Community College – El Reno – \$23,150 (2 years: May 2006)

Mr. Ed Zweiacher and Ms. Amanda Evert of Redlands Community College as well as Mr. Lecil Church of Martin Biochem will led the "Effects of Biochem on Feed Crops of Ruminants" internship program. The interns studied the impact of a Martin Biochem biological soil stimulant on feed crops for goats. The research was conducted at the USDA Grazinglands Research Laboratory (El Reno) and the Redlands Community College Center of Excellence Agriculture Education and Applied Research Center (El Reno). This program was partially supported by the Oklahoma EPSCoR program.

Southwestern Oklahoma State University – Weatherford – \$26,750 (2 years: January 2006)

Dr. Gary Bell, Chair of the Department of Industrial and Engineering Technology, assisted interns researching fluid dispersion for web coating at the Imation Corporation in Weatherford. High-density magnetic storage tape is manufactured by applying fluid dispersions to a "plastic" web carrier. The interns under the direction of Imation mentors investigated the relationship between fluid properties and finished data tape performance.

Northern Oklahoma College – Tonkawa – \$45,282 (2 years: January 2006)

Mr. Rex Ackerson, Chair, Division of Science, Math and Engineering, guided student interns as they interacted with their mentors at ConocoPhillips Research & Development Division in Bartlesville. The interns researched the detailed workings of pilot plants including the measurements of gases, solids, liquids, temperatures, pressure, and power to optimize processes.

Ekips Technologies, Inc. – Norman – \$18,900 (1 year: January 1, 2006)

Roland Ferenczhalmy mentored interns during their research efforts. The project was designed to improve the limits of detection for biomarkers in human and animal breath using a tunable diode laser adsorption spectroscopy system.

Cameron University – Lawton – \$46,970 (2 years: January 1, 2006) \$17,400 (1 year, January 2005), \$27,000 (2 years: May 2003), \$14,070 (12 month Supplement, May 2002), \$11,877 (1 year: January 2001), \$25,223 (12 month Supplement), \$25,326 (2 years: September 1998)

Professor E. Ann Nalley, Chemistry, had student interns at Halliburton Energy Services, Inc. in Duncan. The students studied the development of environmentally responsible polymers through grafting of organic moieties onto natural polymers will be performed. Environmentally friendly products will allow Halliburton to remain a leader in the well servicing industry. In an earlier program Professor Nalley as well as Alex Hammer of Cosmetic Specialty Labs, Inc. (CSL) served as mentors for additional interns at Cosmetic Specialty Labs, Inc. of Lawton.

Oklahoma City Community College – Oklahoma City – \$13,200 (1 year Supplement, January 1, 2007) (12-month Supplement, January 1, 2006) \$31,798 (2-years: January 2004), \$12,020 (12-mo Supplement, January 2003). \$25,390 (2 years: May 2001), \$16,050 (12 month Supplement), \$10,000 (1 year: May 2000), \$4,900 (12 month supplement)

Dr. Charlotte K. Mulvihill directed OCCC's biotechnology program. The interns performed biotechnical research at The Children's Hospital of Oklahoma, Oklahoma Foundation for Digestive Research, The Dean A. McGee Eye Institute, Novazyme Pharmaceuticals, Inc., OUHSC, Advanced Center for Genome Technology, Oklahoma Medical Research Foundation, Analytical Research Laboratories, Presbyterian Health Foundation, Pure Protein, L.L.C., UroCor, Inc., DNA Solutions, Inc., Hyalose, L.L.C., Genzyme Corporation, Ritey Genomics, Inc., and Immuno-Mycologics, Inc.

Ekips Technology, Inc. – Norman – \$22,700 (1 year: July 2005)

Dr. Gina McMillen, D.V.M., Ph.D. of Ekips Technologies, Inc. directed this project designed to develop a rapid sensor to monitor health of newly received calves. The study was conducted at the OSU animal research facility in Stillwater where Dr. Clinton R. Krehbiel and Dr. McMillen mentored students. The specific research will determine if the Ekips Technologies, Inc.'s laser-based breath sensor which is designed to quantify exhaled nitric oxide concentrations will be able to diagnose Bovine Respiratory Disease (BRD) in calves.

Western Oklahoma State College – Altus – \$43,308 (2 years: June 2005), \$39,428 (2 years: January 2002), \$33,677 (2 years: May 1999), \$15,655 (12 month Supplement), \$13,936 (6 month Supplement)

Professor Elizabeth Wallace of Western Oklahoma State College directed this internship program. For the most recent effort the interns worked with Dr. J. C. Banks of the OSU Southwest Research and Extension Center located in Altus. The students investigated several factors which impact the quality of cotton including the affects of mid-fruiting stress on fiber development of individual cotton bolls.

SouthWest Nanotechnologies – Norman – \$10,000 (12 month Supplement: May 2005) \$20,000 (2 years: May 2003)

Drs. Daniel Resasco and Leandro Balzano of SouthWest Nanotechnologies, Inc. of Norman directed interns from Cameron University (Lawton) optimizing the novel CoMoCAT (Cobalt Molybdenum Catalyst) used to produce single-walled carbon nanotubes. This program was partially supported by the Oklahoma EPSCoR program.

Production Specialties, Inc. – Norman – \$40,145 (2 years: May 2005)

Mr. Ken Stamper of Production Specialties, Inc. in Norman directed interns working on two projects which overlap the agriculture and energy sectors: (1) improving the economics of recovering primary plant nutrients from animal waste feedstock, such as poultry litter or poultry manure and (2) studying the removal of hydrogen sulfide from biogas and natural gas streams to make a commercially viable product.

Weather Decision Technologies – Norman – \$52,500 (2 years: May 2005), \$40,069 (2 years: May 2002)

Mr. Dewayne Mitchell of Weather Decision Technologies, Inc. in Norman directed interns working on developing a lightening decision support system that can be used by the property and casualty insurance industry. In a previous program Michael Eilts, President, led the internship program "Developing a Hail Decision Support System." Meteorology and computer science undergraduate students from The University of Oklahoma are researched the development of a hail decision support system.

Fort Environmental Laboratories, Inc. – Stillwater – \$47,908 (2 years: May 2005)

Dr. Douglas Fort of Fort Environmental Laboratories, Inc., Stillwater, directed interns who worked on the validation of a commercial test kit which evaluates substances that might disturb reproductive and development processes in humans and wildlife by interfering with the endocrine system.

Oklahoma State University – Stillwater – \$60,000 (2 years: May 2005), \$48,000 (2 years: May 2003), \$100,000 (2 years: January 2002)

Dr. Frank Chambers directed the Mercury Marine R&D Intern Program at Mercury Marine, Stillwater. The award allowed student interns to conduct marine engine technology research. This program was partially supported by the Oklahoma EPSCoR program.

Tulsa University – Tulsa – \$60,000 (2 years: May 2005), \$60,000 (2 years: January 2005), \$40,000 (2 years: January 2004), \$51,565 (2 years: January 2003), \$54,425 (2 years: May 2002)

Dr. Surendra Singh, Electrical Engineering, directed the internship program "Design and Development of Intrusion Detection Systems". A program with Century Geophysical Corp. of Tulsa which began in mid-2005. The 2005 Supplement was for the interns to work with the design, development, and testing of the Mini Air Drop Seismic System (MADS) with satellite communication at QUAL-TRON, Inc. In another program he directed the internship program "Design and Development of Resistivity Imaging Tool." Electrical engineering students were researching development of borehole imaging tools at Tucker Technologies, Inc. in Tulsa.

Strategic Solutions International, LLC – Stillwater – \$50,000 (2 years: February 2005)

Dr. Steven Trost, PI, of SSI directed students from the Oklahoma State University College of Engineering for a project developing new devices to assure quality concrete for highway construction.

Pure Protein, LLC – Oklahoma City – \$49,200 (2 years: January 2005)

Drs. Rico Buchli and Wei Jing directed biotech intern projects including optimization of in vitro polymer synthesis, the production rate determination of transfectant cell clones, and fermentation production facility establishment tasks. Interns worked at Pure Protein, LLC, and at Hyalose in Oklahoma City.

Precision Design, Inc. – Weatherford – \$54,000 (2 years: January 2005)

Mr. W. C. Easter, PI, directed advanced aerospace R&D activities of interns from Southwestern OSU involving prototype and reproduction aircraft parts. Interns learned basic and advanced skills such as Computational Fluid Dynamics.

Southwestern Oklahoma State University – Weatherford – \$20,936 (2 years: April 2004)

CDFA, Inc. of Weatherford is a leader in the implementation of state-of-the-art object-oriented design in the .Net environment. The company had interns from Southwestern Oklahoma State University developing retail distribution software. The award was made to Dr. Harpal S. Dhillon of SWOSU. This program was partially supported by the Oklahoma EPSCoR program.

Cameron University – Lawton – \$28,992 (2 years: April 2004).

Dr. Mary T. Dzindolet, of Cameron University, was awarded funds for interns to work on maximizing human-computer interactions for the Army Research Laboratory. The interns will gain experience and exposure to the scientific method and to experimentation in the human factors field. This program was partially supported by the Oklahoma EPSCoR program.

Tulsa University – Tulsa – \$40,000 (2 years: April, 2004), \$7,089 (6 month Supplement, April 2002), \$60,000 (2 years: May 2002), \$29,055 (1 year: January 2001)

Engineering interns from The University of Tulsa assisted the Zebco Corporation of Tulsa in the development of a new line of electro-mechanical fishing products based on force sensing technology. The funding award was made to Dr. Steven M. Tipton of The University of Tulsa.

Redlands Community College – El Reno – \$21,236 (2 years: April, 2004)

Interns from Redlands Community College under the direction of Sam Nusz researched at the Darlington Goat Dairy studying dairy goat lactation compared to regulated feed intake. The research results assisted the Oklahoma goat producers to assist their planning and analysis of the cost effectiveness of their operations.

Cameron University – Lawton – \$20,600 (2 years: April 2004), \$11,327 (1 year: January 2003), \$11,000 (12-mo Supplement, July 2002), \$10,000 (1 year: May 2001)

Eagle Systems and Services, Inc. of Lawton had interns from Cameron University developing technology-based training for the National Emergency Training Center. The award was made to Dr. Linda Wright-Smith of Cameron University who assisted the interns. Ms. Janie Lytle of Eagle Systems and Services, Inc. served as mentor.

Southwestern Oklahoma State University – Weatherford – \$35,434 (2 years: May 2003)

Dr. Harpal Dhillon leads the internship program. The student interns helped design a paperless information system for collecting, storing, and transmitting manufacturing floor data in a modern food processing plant at Bar-S Foods Co in Lawton.

University of Central Oklahoma – Edmond – \$37,400 (2 years: January 2003)

Professor John Garic had interns at General Motors working in the areas of process capability and repeatability studies and with Fanuc robots. An intern at Sandy Beaches Software was writing software for a technologically improved product for a browser based order entry – customer service system.

Alchem Field Services, Inc. – Oklahoma City – \$15,000 (1 year: January 2004;)

The oil and gas industry benefited from this award to William Cox of Alchem Field Services, Inc. of Oklahoma City for interns to assist in research for converting natural gas to light crude oil using a Fischer-Tropsch process.

Cameron University – Lawton – \$71,804 (2 years: January 2003), \$18,373 (1 year: January 2000), \$20,923 (1 year: May 1999)

Professor Don Aguilar, Multimedia Design, had interns at the Advanced Systems Technology, Inc. facility in Lawton. The latest project has the interns developing training for use in a Voice over Internet protocol (VoIP). The technology permits world-wide transmission of synchronous lessons from Lawton, Oklahoma. It also permits the recording and streaming of hour-long sessions low-bandwidth accessibility. Previous projects have included developing software for training first responders, for training crime scene technicians in handling DNA evidence, and for training for correctional officers.

Tulsa University – Tulsa – \$20,000 (12 month Supplement: January 2004), \$40,057 (2 years: May 2002)

Dr. William Potter, Chemistry, directed the program "Automotive Catalyst Materials Development Internships". Chemical engineering and geosciences students investigated new catalysts to help clean up engine exhaust streams at Delphi Automotive Systems in Tulsa.

Cameron University – Lawton – \$10,000 (1 year: May 2003)

Dr. Feridoon Moinian, Ph.D., directed the program at Tec Masters, Inc of Lawton where the student interns adepted *FireSim XXI* for use in training by developing software simulations and modeling software.

Northern State College – Tonkawa – \$42,246 (2 years: January 2002), \$20,000 (2 years: January 2000)

Dr. Virgil Ackerson had interns working summers learning pilot plant and research laboratory skills at Conoco, Inc in Ponca City.

Weather Decision Technologies – Norman – \$40,069 (2 years: May 2002)

Michael Eilts, President, led the internship program "Developing a Hail Decision Support System." Meteorology/ and computer science undergraduate students from The University of Oklahoma are researching the development of a hail decision support system.

Eastern Oklahoma State College – Wilburton – \$25,600 (12-mo Supplement, May 2003), \$65,444 (2 years: January 2002)

Professors Leo Hall, Ph.D., and Maurice Hawthorne directed the Defense Ammunition Center internship program. The award allows interns to work at the DAC producing a comprehensive package that identifies federal and state regulatory requirements for the operation of hazardous waste combustors. The award was equally matched by the U.S. Army Ammunition Center, McAlester. The supplement was unique in that two of the interns will be current students at Eastern State College and two will be OSU undergraduates.

Oklahoma State University – Okmulgee – \$99,847 (2 years: May 2002)

Prof. Scott Newman, Chair of Information Sciences, directed the program “The IT Enterprise Development Initiative.” Undergraduate Information Technology majors worked at EDS in Tulsa with an emphasis on enterprise development research.

Cameron University – Lawton – \$10,005 (1 year: January 2003), \$11,750 (1 year: January 2002)

Prof. Abbas Johari, Ph.D., Cameron University, directed the Computer Based Training for CNAC internship program at DRC Oklahoma, Midwest City. The interns developed web based training material.

Cameron University – Lawton – \$10,040 (1 year: May 2002)

Dr. David Rokh, Professor of Mathematics, and student interns developed a software tool for detecting errors in object oriented software that is currently in use at Halliburton in Duncan.

Cameron University – Lawton – \$10,000 (1 year: January 2002)

Jim McClary directed the Fires and Effects Simulation internship program at Tec Masters, Inc., Lawton. Interns worked fire and effects simulation using modeling, simulation, and multimedia techniques at Tec Masters, Inc., Lawton.

Oklahoma State University – Stillwater – \$16,000 (1 year: May 2001)

Dr. Thomas Bertenshaw directed interns working with Unit Parts Company in Oklahoma City researching advanced alternator and starter technologies.

University of Central Oklahoma – Edmond – \$20,000 (two years: May 2001)

Dr. David L. Elmendorf joined student interns to study the removal of non-point pollution as a result of concentrated animal feeding operations at the USDA Grazinglands Research Laboratory.

University of Central Oklahoma – Edmond -- \$26,114 (1 year: January 2001)

Professor John M. Hranitz received funding for student interns from UCO's biology department to intern at Hyalose, IPS Research Co., MedSynergy, and Pure Protein, LLC in Oklahoma City.

The University of Oklahoma – Norman – \$40,371 (2 years: January 2001)

Professor Linda DeBrunner, with Dr. Bruce Russell and Dr. Victor E. DeBrunner, had student interns working with a multidisciplinary team of engineers to solve highway bridge longevity problems. The project assisted Scrub Oak Technologies, Inc. develop new technologies for increasing roadway bridge longevity in a project supported by the Federal Highway Administration.

University of Central Oklahoma – Edmond – \$45,000 (2 years: May 2000), \$50,000 (2 years: January 2000), \$10,000 (1 year: May 1999)

Professors William J. Radke and S. Narasinga Rao had a multifirm internship program. Student interns at Unit Parts Company of Oklahoma City research the development of improved universal alternators, AC/DC generators, permanent magnet and brushless alternator technology, and new high efficiency alternators. Student interns at the Oklahoma City General Motors Plant worked with several Preceptor measurement systems for carrying out precise measurements of Full Body and Underbody components. At Computer Risk Management interns studied how to make better use of internet bandwidth to increase communication.

Carl Albert State College – Poteau – \$40,920 (2 years: May 2000), \$20,420 (12 month Supplement)

Bill Gann, Chairman of Telecommunications, directed a project for applied research in telecommunications. Student interns studied the development of new service systems at WorldCom and on the Carl Albert State College Campus. This unique program included WorldCom mentors coming to the CASC campus as well as interns working at the WorldCom facility in Tulsa.

University of Central Oklahoma – Edmond – \$23,000 (2 years: May 2000)

Dr. James E. Bidlack, Biology, joined four student interns as a faculty intern in a project at the USDA-ARS Grazinglands Research Laboratory in El Reno. The research focused on improving weed control in wheat/legume cropping systems that should lead to improved wheat production in Oklahoma.

Oklahoma State University at Oklahoma City – Oklahoma City - \$46,906 (2 years: May 2000)

Dr. Jerry Nielsen lead a team of faculty and student interns at OKLABS, Inc. (Oklahoma City) and at the OSU Food and Agriculture Products Research and Technology Center (FAPC) in Stillwater. Dr. Nielsen and Dr. Armando L. Cruz-Rodz, served as faculty interns. At OKLABS, Inc. the interns studied the shelf life of pecan oil and pecans from which the oil has been extracted. At FAPC they research the development of enhanced pecan products.

Redlands Community College – El Reno – \$60,000 (2 years: January 2000)

Professor R. Gossen served as a faculty intern in addition to student interns. The interns performed research at the U.S. Department of Agriculture Grazinglands Research Laboratory studying cool-season grasses, the development of crossbred sheep, improvement of grain quality and on-farm finishing. This project directly benefited the Hydro Cooperative Association (Hydro), Regier Farms (Weatherford), Ringtail Farms (Duncan), and Ag-Renewal (Weatherford) as well as farmers and ranchers throughout Oklahoma.

OSU-Tulsa – Tulsa – \$31,340 (2 years: May 1999)

Professor Steve Bell, Electrical Engineering, had electrical engineering students interning at the Williams Companies in their network architecture group.

Carl Albert State College – Poteau – \$11,521 (1 year: September 1998)

Steven Hughes, Chemistry, P.I., led this program which had Mr. Mike Green as a faculty intern in which he performed water analyses of Lake Wister under the guidance of staff from the Poteau Valley Improvement Authority, the LaFlore County Conservation District, the Oklahoma Water Resources Board, and Applied Energy Services. Students gathered samples and performed laboratory work while gaining knowledge about the work performed by technical workers. Carl Albert State College was awarded \$41,645 from the Oklahoma Water Resources Board to support continuation of the project.

University of Central Oklahoma – Edmond – \$63,371 (2 years: September 1998)

This program was directed by Professor Olivia Hanson, Chemistry. Interns served at Analytical Research Laboratories (Edmond), Applied Automation (Bartlesville), Kerr-McGee Chemical Corporation (Oklahoma City), UroCor, Inc. (Oklahoma City) and ZymeTx, Inc. (Oklahoma City). The firms cited retaining employees, new product development, and the development of skilled employees as benefits of the program.