



OKLAHOMA LOUIS STOKES AMP

Oklahoma Louis Stokes Alliance for Minority Participation in
Science ↔ Mathematics ↔ Engineering ↔ Technology

**1999 Report for
Performance Effectiveness Review**

**to
Division of Education and Human Resource Development
Alliances for Minority Participation**

**at
NATIONAL SCIENCE FOUNDATION
ARLINGTON, VIRGINIA**

31 October 1999

**Prepared by
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Oklahoma Alliance for Minority Participation
"PROGRAM EFFECTIVENESS" REVIEWS (P.E.R.)
October 30, 1999
The National Science Foundation
4201 Wilson Blvd. ROOM 815
Arlington, VA 22230

I. PROGRAM PERFORMANCE.

National. The annual nation-wide growth in baccalaureate degrees earned by underrepresented minorities *(Native American, African-American, Hispanic) in SMET fields has progressed steadily but poorly when compared to whites by 5.3% from 1994 to 1995 and by 8.5% from 1995 to 1996. Overall increases by only 1.9% and 2.7% were seen for the combined pool of whites and underrepresented minorities from 1994 to 1999 (Figure 1.). Among white SMET students nationally, gains averaged only 1.6% from 1994-96. (Appendix Tables 1. Production of Minority BS SMET Graduates in Okla. Alliance; Table 2. SMET Degree Data for the state; Table 3. SMET Enrollment for the state.)

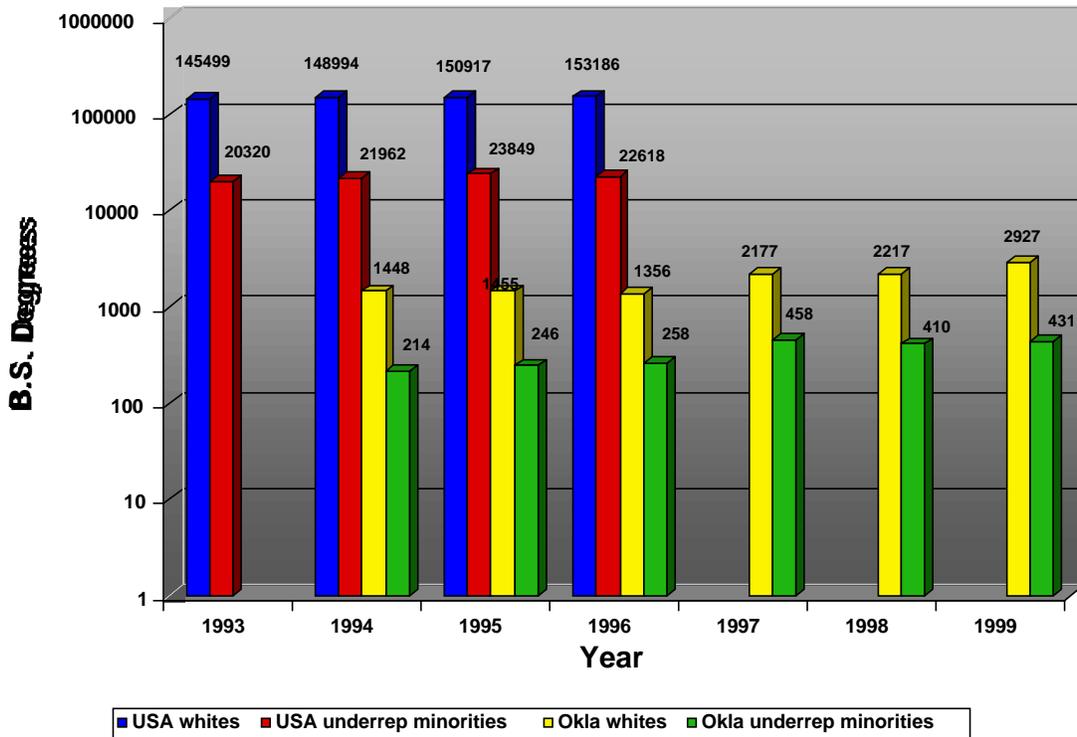


Figure 1. Nationwide: SMET Bachelors Degrees Awarded to Whites & Underrepresented Minorities from 1994-99. National data for 1998 are not available.

Oklahoma Louis Stokes AMP (OK-LSAMP) In comparison, the annual growth in the number of minority undergraduate degrees conferred in Oklahoma continues to outpace the national course. This is largely due to the efforts of the **OK-LSAMP**, which in 1994 proposed a 15% annual increase from a baseline of 214 degrees awarded to underrepresented students in SMET. The noticeable growth in Bachelor’s Degrees conferred in SMET fields to underrepresented minority populations *(Native American, African-American, Hispanic only; not including Native Pacific Islanders) began in 1995 with an initial increase from the baseline by 13% (n=246). This was followed by a modest 4.6% increase in 1996. And, in 1997, a remarkable surge of 43.6% (n=458) was seen. The following year, the projected growth pattern resumed but the 410 new SMET degrees earned in 1998 still exceeded the predicted increase by 36 degrees awarded. After the five years we slightly exceeded our original goals of 430 BS degrees. These numbers do not reflect all of the CIP coded used in the 1994 Base line. We also can not determine the exact number of Pacific Islanders because of the incorporation of Asians and Pacific Islanders in the same category. **Figure 2.** Illustrates the changes through 1999.

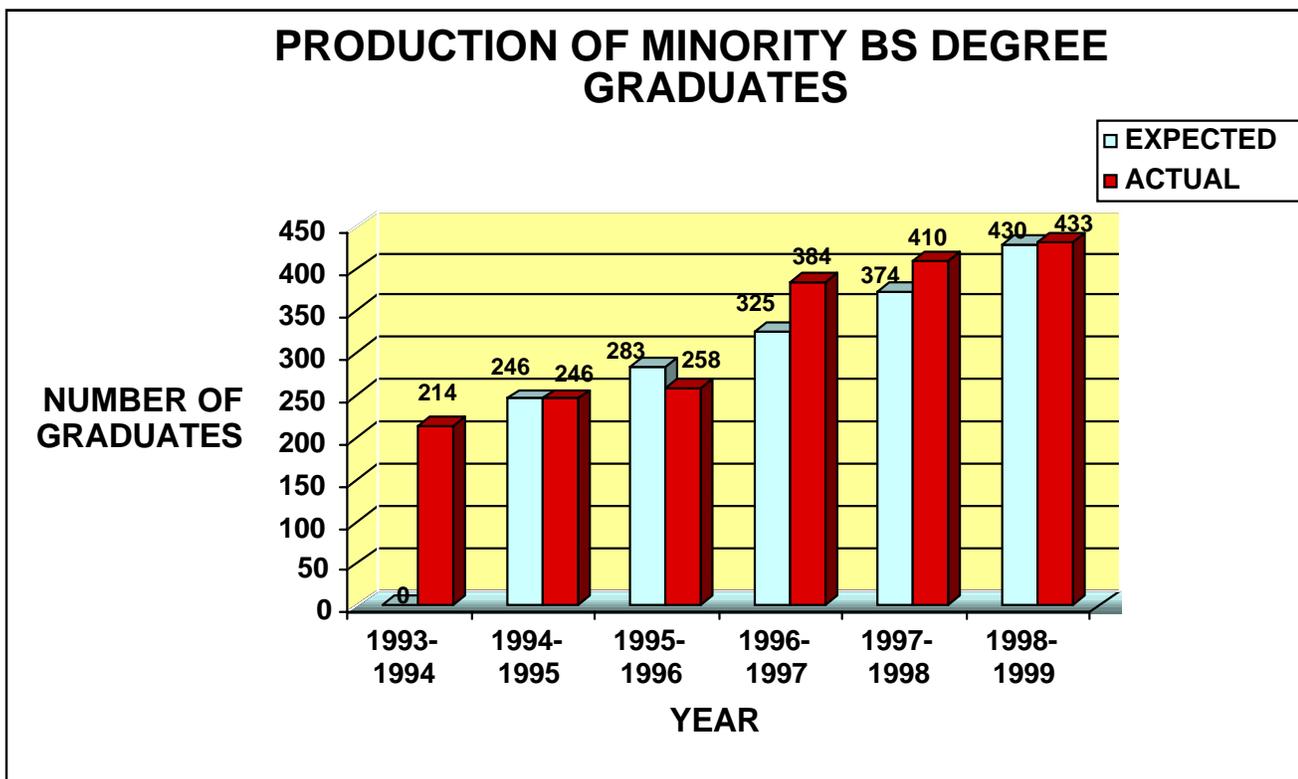


Figure 2. B.S. Degree in SMET fields from the 1994 Base line of 214. The numbers do not include Pacific Islanders. This includes all Partner and Affiliate institutions that are participants in the Oklahoma Louis Stokes AMP program.

The distribution of the minority B. degrees are listed in Table 1

1998-99	AA	NA	H	A/P	Non-Minority
Male	86	131	44	131	2023
Female	60	88	21	61	904

Total	146	219	65	192	2927
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Table 1. Distribution of Minorities in SMET B.S. Degrees -1999

Distribution of B. S. Degrees by Ethnicity

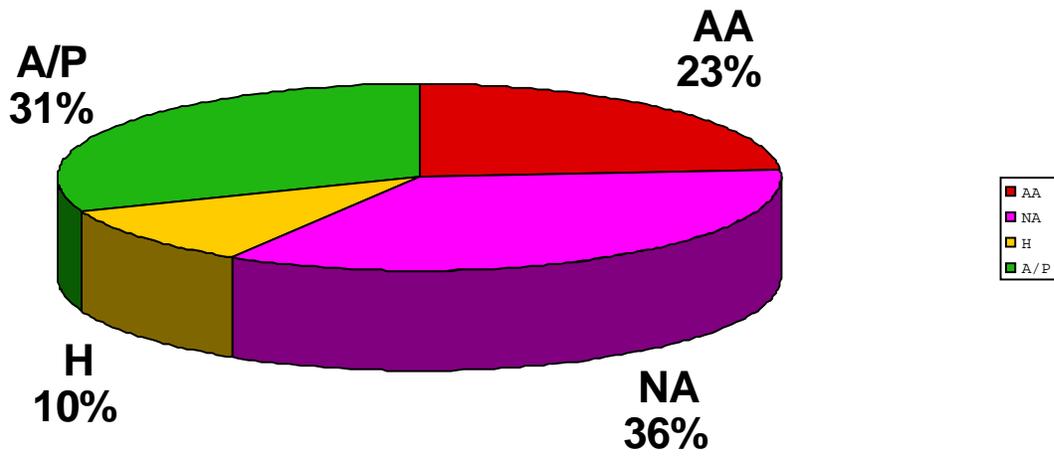


Figure 3. Ethnic Distribution of Minority B.S. degrees

Native Americans continue to be the largest Ethnic Group in Oklahoma. The number of B.S. Degrees earned in Oklahoma continues to lead the nation. This is particularly true for a state with a Native American population from the 1990 U.S. Census of 8.6%, which is the largest minority ethnic group in Oklahoma.

Enrollment: The enrollment of minorities in those fields encompassing the disciplines supported by the Louis Stokes AMP has significantly increased in Oklahoma. This is an indication of the popularity of the fields in addition to the perception that these are the best opportunities for employment. One very interesting observation is the number of African Americans enrolled in SMET fields is higher than the number of Native Americans. But the graduation of Native Americans in the SMET fields is higher than the African Americans. Asians continue to be well represented in SMET fields as it is in the Nation.

Undergraduate Enrollment Fall -1998

AA	NA	AP	HI	WHITE	Total Minorities
1320	1561	1035	605	15,058	4521

TABLE 2. DISTRIBUTION OF ENROLLMENT BY ETHNICITY

UNDERGRADUATE ENROLLMENT FALL 1998

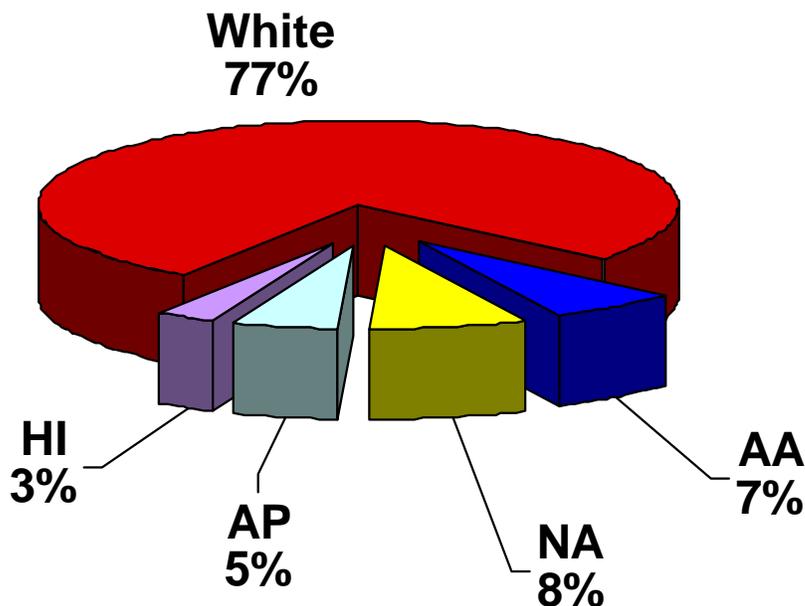


Figure 4. Distribution of Enrollment in SMET Fields by Ethnicity:

The Enrollment shows Native American to be the largest minority group enrolled in higher education. The Native American population according to the 1990 Census was 8.6% of the population. The enrollment in SMET fields is close to 8%, which is less than parity. Asians are enrolled at more than twice their population. This is in accordance to the National trend. Because the state data system does not differentiate between Asians and Pacific Islanders, it is difficult to accurately obtain the enrollment numbers. Nevertheless, we have been able to include a few in our program.

II. VALUE ADDED

All participants must participate in all of the following activities. In Partner Institutions some of the activities vary but the essential components include activities that enhance academic performance. The results of many of the activities are an improvement in the overall GPA of OK-LSAMP students. The one thing that we all have noticed is the increased awareness and accountability of students in assessing their academic achievement and seeking help in order to increase their academic performance; that is, to seek tutoring in order to lift a grade from a B to an A.

All of the above activities lead to more active students involved with their education. The mentoring component leads to a Summer Internship that is continued during the academic year where it is possible. Other students are able to do Internships at The Los Alamos and Sandia National Laboratories.

EAST CENTRAL UNIVERSITY

Three of our OK-LSAMP students represented East Central University at the Research Day at Regional Universities at the University of Central Oklahoma on October 8, 1999, based on their summer research projects. Here are their names and the titles of their poster presentations.

Tracy Pardue: Possible defense related enzymes of cantaloupe fruit: characterization of chitobase.

Scott Linthicum: Pathogenic-fungal production of Beta-galactosidase in inoculated cantaloupe fruit

Kristi Carson: Effects of Sugars and Media upon Chlamyospore Production in Acremonium.

All three are biology majors at ECU and were sponsored by Dr. Charles Biles and Dr. Terry Cluck of ECT and Dr. B. D. Burton and J. X. Zhang of the USDA-ARS at Lane, OK.

In addition, Patricia Davis, a 1998 OK-LSAMP graduate, has returned after doing medical research at Johns Hopkins University to become the McNair Scholars Academic Coordinator at ECU, working with minority and first generation college students.

LANGSTON UNIVERSITY

The Langston University OKAMP Program has improved in the following ways:

- 1) The number of students who graduate each year has increased.
- 2) The number of graduated students who attend graduate schools in science has increased.

- 3) The number of students engaged in undergraduate research in their major fields has increased. The variety of major fields in which these students do research has increased, and the quality of the work has improved.
- 4) The number of students supported by the Program has increased, although the amount of support has, because of funding cuts, decreased. In Phase II a larger percentage of the support will go to student researchers.
- 5) Closer mentoring, supervision, and monitoring of student performance has been introduced.

OKLAHOMA STATE UNIVERSITY

SPECIAL ACKNOWLEDGEMENT - TECHNOLOGY TRANSFER BY AN UNDERGRADUATE

Paul De La Cerda, Senior; Civil Engineering, Oklahoma State University

Mentor and Co-Sponsor: Mrs. Sharon Maxey, Emerging Enterprises, Inc. Tulsa, OK

Jim Henderson, CEAT Senior Applications Engineer, 307 CITD Stillwater, OK

Title: Pooch Pass (TM) Manufacturing Process



FIGURE 5. Paul De Lacerda explaining his “Pooch Pass” to an Elementary School Science class (Paul De Lacerda is a Louis Stokes AMP Student who is in the process of implementing an invention that he developed while engaged as an AMP student at Oklahoma State University. Paul was planning to drop out of school after he decided to give up a long distance running Scholarship. He joined the AMP program and became involved with the AMP cadres and regained his academic competitiveness. He is one of the true success stories of the AMP program- an undergraduate student immanently involved with technology transfer after filing a patent forming his company and using the AMP Internship to implement technology transfer)

The “Pooch Pass” allows safe and convenient pet entry into the home, while eliminating security concerns for the pet owner. A magnetic key reader recognizes a specific pet and enforces a

locking system against uninvited guests. The "Pooch Pass" is a security guard for homeowner's premises by allowing their pet in and keeping intruders out.

Paul De La Cerda will be working with various OSU engineering professors and many private Oklahoma manufactures while conducting his research for his OK-LSAMP Summer Research Project to develop a functional prototype of the "Pooch Pass".

The steps taken in order to manufacture the Pooch Pass are as follows:
Write an effective business plan, Develop a New Invention Process Flow Chart, Evaluate Initial Feasibility, Develop and Demonstrate Enabling Technologies, Perform Detail Design and Documentation, Fabricate Prototype, Identify Facility Requirements for both Pilot Line and Production, Prepare Cash Flow Analysis, Prepare Pilot Production Facility, Tooling, and Process Documentation, Complete Production Facilities and Tooling, Scale-up to production.

NORTHEASTERN STATE UNIVERSITY (NSU)



Figure 6. Lisa Phillips, Northeastern State University; A senior in chemistry spent the summer working in an USDA Plant Biotechnology Genetics Laboratory in Manhattan, Kansas. Her research required her to use the Polymerase Chain Reaction (PCR) to study how plants generate new genetic variations.

SOUTHEASTERN OKLAHOMA STATE UNIVERSITY (SEOSU)

Activities of OKLSAMP students (names in boldface type) from Southeastern Oklahoma State University, 1999:

Citations for papers and presentations:

Regional Research Day, Oct 8., 1999; Univ. of Central Oklahoma, Edmond, OK.

Title: EXPLORATIONS OF ALKYL POLYALCOHOLS AS "CLASS I" ORGANIC MODIFIERS TO ADJUST SELECTIVITY IN MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY.

Gerald I. Love and Joel T. Smith; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701-0609.

Title: PREDICTING THE EFFECTS OF ORGANIC MODIFIERS ON SELECTIVITY IN MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY.

Athena Dawson and Joel T. Smith; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701-0609.

American Chemical Society Pentasection Meets, Oct. 9, 1999; University of Tulsa, Tulsa, OK.

Title: EXPLORATIONS OF ALKYL POLYALCOHOLS AS "CLASS I" ORGANIC MODIFIERS TO ADJUST SELECTIVITY IN MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY.

Gerald I. Love and Joel T. Smith; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701-0609.

Title: MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY.

Athena Dawson and Joel T. Smith; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701-0609.

Title: ADJUSTING SELECTIVITY IN MEKC USING "CLASS I" ORGANIC MODIFIERS.

Joel T. Smith, **Gerald I. Love** and **Athena R. Dawson**, Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701

Frederick Conference on Capillary Electrophoresis, Oct 18-20, 1999; sponsored by the National Cancer Institute, Hood College, and Frederick, Maryland.

Title: Explorations of Alkyl Polyalcohols as "Class I" Organic Modifiers to Adjust Selectivity in MEKC.

Gerald I. Love, **Athena Dawson**, and Joel T. Smith, Southeastern Oklahoma State University, Department of Physical Sciences, P.O. Box 4025 - Campus, Durant, OK 74701, USA

Title: ADJUSTING SELECTIVITY IN MEKC USING "CLASS I" ORGANIC MODIFIERS.

Joel T. Smith, **Gerald I. Love**, and **Athena Dawson**; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701

21st International Symposium on Capillary Chromatography and Electrophoresis, June 2--24, 1999; Park City, Utah.

Title: ADJUSTMENT OF CHROMATOGRAPHIC SELECTIVITY IN MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY USING "CLASS I" ORGANIC MODIFIERS.

Joel T. Smith, **Gerald Love**, and **Athena Dawson**; Southeastern Oklahoma State University, Department of Physical Sciences, Durant, OK 74701

Title: EXPLORATIONS OF ALKYL POLYALCOHOLS AS "CLASS I" ORGANIC MODIFIERS TO ADJUST SELECTIVITY IN MICELLAR ELECTROKINETIC CAPILLARY CHROMATOGRAPHY

Gerald I. Love, **Athena Dawson**, and Joel T. Smith, Southeastern Oklahoma State University, Department of Physical Sciences, P.O. Box 4025 - Campus, Durant, OK 74701, USA

Other activities:

Joe M. Williams (zoology). Completed a summer internship with the Oklahoma Department of Wildlife Conservation, State Fish Hatchery, Armstrong, Oklahoma.

Justin H. Brown (technology). Completed a summer internship with Sundowner Trailers, Department of Research and Design, Wapanucka, Oklahoma.

Joe M. Williams (zoology) and **Melissa Morales (zoology)** attended the Oklahoma Academy of Science Field Meeting, September 17-19, Black Mesa State Park, Kenton, Oklahoma.

OK-LSAMP SUMMER SYMPOSIUM – AUGUST 1999

Title: "Investigations of Innovative Remediation Techniques of Brine-Impacted Soils"

Joseph L. Jones, Post-Baccalaureate Degree Bridge Program, BS Environmental Engineering, 1999, Oklahoma State University

Mentor: Dr. J Veenstra, Civil and Environmental Engineering Oklahoma State University, Stillwater, OK

The research to date and for the remainder of the summer will involve data collection and site characterization for the research area. Soil samples have been collected and tests are currently in progress to determine soil parameters and constants. Future soil samples and site visits will be performed later in the summer to evaluate changes in parameters as the moisture in the soil decreases.

The data collected from this summer will be used as the baseline information for future research at the site. Future plans include the installation of a leachfield and evaporation pond to investigate the removal of high salt concentration in the soil.

Title: "The Evaluation of Natural Compounds for Use in Insect-Resistant Food Packages"

Thomas R. Jones II, Senior Animal Science/Biotechnology, Oklahoma State University

Mentor: Thomas Phillips, Ph.D., College of Agriculture and Natural Sciences/ Department of Entomology and Plant Pathology, Oklahoma State University, 230 NRC, Stillwater, OK

Many types of food packages are susceptible to insect infestation. Currently, the project is designed to explore and develop methods needed to incorporate natural compounds into food packages. The project is also designed to actually test these natural compounds in bioassay tests.

Title: Apparent Density Testing

Johnetta Nesbitt, Junior, Chemical Engineering, Oklahoma State University

Mentor: Hooshang Jozavi, Senior Staff Engineer (Chemical), Conoco Inc., 1000 S. Pine, 6658 RW, Ponca City, OK

The project focuses on identifying an apparent density test method to replace the current mercury test method. Mercury is being replaced because of its toxicity and harm to the environment. As a result of findings from a literature research, several methods are being tested in the laboratory.

Title: STATISTICS: The Journey to Success

Michelle Asare-Imhotep, Junior, Statistics, Oklahoma State University

Mentor: Dr. Brenda Masters, Statistics Department, Oklahoma State University, Stillwater, OK

The specific intention of this project was to provide prospective statistics majors with easily accessible information about being a Statistician. Specific areas that are focused on are job opportunities, job rankings, salary, work environment, and educational opportunities. The statistical methods used in this research project are information dispersion, data collection, and calculating the percentage of groups of interest and categorical information. I have found web pages on scholarship information, salary, job environments, and statistics programs at different universities, internships, and statistics organizations.

Title: The Microbial Analysis of Snail Mucosa in *Limax marginatus* and *Limax flavus*

Stormy D. Beasley, Senior, Biology, University of Science and Arts of Oklahoma

Mentor: Dr. Charles Mather, Department of Biology, University of Science and Arts of Oklahoma, Chickasha, OK

The intention of this project is to investigate the microbial properties and functions in the mucosa of *Limax marginatus* and *Limax flavus*. We hope to discover whether or not the microbial properties of the mucosa are inhibitory and serve as a method of protection. Thus far, we have determined that the bacteria in *Limax marginatus* are aerobic bacteria from stab cultures. From slide preparations, we have determined that the bacteria are Gram negative bacilli, streptobacilli, and cocci.

Title: Bone Loss of Rats due to Tail Suspension

Mary Rachel Bell, Junior, Nutritional Sciences, College of Human

Environmental Sciences, Oklahoma State University

Mentor: Dr. Barbara Stoecker, College of Human Environmental Sciences, Nutritional Sciences Department, Oklahoma State University, Stillwater, OK

This study is being conducted to see whether certain diets can help to prevent bone loss in rats, which would then be applied to humans, when rats are tail suspended, which would be the equivalent of a human in outer space, or during bedrest. It is hoped that one of these diets will help to slow the deterioration of the bone. The trace minerals are being measured to see if they are affected by the diet, or if they have an effect on the outcome. The animals were tail-suspended while being fed control diets or experimental diets, they were then sacrificed. Their bones, like their 4th lumbar, were extracted along with their heart, kidney, and liver. The minerals contained in these organs will continue to be measured using the Atomic Absorption Analyzer, and other methods.

Title: Extraction and Analysis of Humic and Fulvic Acids From Landfill Leachate

Constance Burris, (A.S., Pre-engineering, OCCO, May 1999), Junior, Civil Engineering and Environmental Science, University of Oklahoma

Mentor: Dr. Mark Nanny and Crystal K. Stearns, Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK

Leachate is water that comes in contact with waste material. Humic and fulvic acids are organic materials that can be found in both landfill leachate and soil. The speed with which a

contaminant moves through a system greatly depends on the concentration of the organic materials in the leachate. This study seeks to identify the most effective extraction and analysis methods.

Title: Effects of Sugars and Media upon Chlamydospore Production in *Acremonium*

Kristi Carson, Senior, Biology, East Central University

Mentors and Sponsors: Dr. Terry Cluck and Dr. Charles Biles, Department of Biology in the School of Math and Science, East Central University, Ada, OK

Dr. B.D. Bruton and J.X. Zhang, USDA-ARS, Lane, OK

Acremonium sp. is a fungus that primarily infects plants in the Cucurbitaceae family. When it was described in 1996, chlamydospores, an overseasoning fungal structure that may provide the primary inoculum in the disease cycle, were reported as “normally absent” but appearing in 45-day old cultures. In order to identify what might induce chlamydospore production in *Acremonium*, isolates from infected cantaloupe plants were grown in two different media, potato dextrose broth (PDB) and a basal salt medium called Richard’s (RM), with one of the following sugars added: galactose, glucose, maltose, mannose, and sucrose. After two weeks, hyphal samples were removed from the broth, broken apart with a polytron, and viewed for the presence of chlamydospores. Chlamydospores were present in all samples grown on PDB. The effect among the sugars was no different with an average of 815,000 chlamydospores/mL. There was a difference in the response among the isolates to all sugars with some isolates averaging small numbers of chlamydospores (240,000 chlam./mL) and some large numbers (1,160,000 chlam./mL) across all sugars. Preliminary experiments indicate that isolates grown in RM produce many conidia but very few chlamydospores.

Title: Sequestering Carbon Dioxide in Coalbeds

Lorna Carter, Senior, Chemical Engineering, Oklahoma State University

Mentor: Dr. K.A.M. Gasem, Chemical Engineering, Oklahoma State University, Stillwater, OK

To address the serious problem of CO₂ pollution—from coal burning and other sources—the research teams of Drs. K.A.M. Gasem and R.L. Robinson, Jr. will investigate the feasibility of using coalbeds to sequester CO₂ by absorption on the surface of coal. This investigation is a unique opportunity to evaluate the ability of coal to remove this major pollutant/greenhouse gas (CO₂) from the atmosphere and, *simultaneously*, to increase the supply of a significant, clean-burning energy source (methane). The latter, secondary objective can be realized because coalbeds contain enormous (adsorbed) methane reserves that can be desorbed when contacted by the injected CO₂ and produced to yield a valuable energy source.

The specific focus of the research is to investigate the competitive adsorption behavior of methane, CO₂, and nitrogen on the surface of a variety of coals. Measurements will focus on the adsorption of the pure gases, as well as their mixtures. Data will be taken on coals of various physical properties at appropriate temperatures, pressures, and gas compositions to identify the coals and conditions for which the proposed environmental and energy applications are most attractive.

In addition, mathematical models will be developed to describe accurately the observed adsorption behavior. The combined experimental and modeling results will be generalized to provide a sound basis for performing reservoir simulation studies to evaluate

the potential for injecting CO₂ or flue gases into coalbeds to sequester CO₂ (and to enhance methane production). The results will provide valuable input to future computer simulations to assess the technical and economic feasibilities of the process for specific candidate injection sites.

Title: Contingency Analysis of Power Systems

John Castro II, Junior, Electrical Engineering, Oklahoma State University

Mentor: Dr. Tom Gedra, Electrical Engineering, Oklahoma State University, Stillwater, OK

The project consists of reviewing existing power systems throughout the country, mostly in this part of the state, which is called the Southwest Power Pool (SPP). I am working on looking at these systems, then making contingency plans for these systems. I intend to find more efficient and more secure ways to rearrange the power systems in case of incidents such as lightning and natural disasters. We are using a program developed by PowerWorld that simulates power systems and allows you to create power systems. Since the magnitude of the power systems that we are researching are so large, we are using model reduction to decrease the number of components and looking at the system as more of a whole. As of now, the program is understood, and we are now recreating existing power systems and making improvements where possible.

Title: Herpetological Survey for the Chickasaw National Recreation Area

Adrienne Cooper, Junior, Conservation Biology, St. Gregory's University

Mentor: Dr. Doyle Crosswhite, St. Gregory's University, Science Dept, Shawnee, OK

The Chickasaw National Recreation Area (CNRA) has a diverse herpetofauna. Despite this diversity, records for many areas including CNRA are lacking. To fill many of these gaps in our knowledge, we propose to initiate a Herpetological survey of the area. Several states around the country have initiated such projects including Georgia, Wisconsin, and Alabama (Casper, 1996; Jensen and Moulis, in press). The purpose of this survey is to document the current distribution of animals within CNR.

Title: Effects of Root Hairs in Fluid-Flow Resistance in Root Culture

Mark Clytus, Senior, Chemical Engineering, Oklahoma State University (not present)

Mentor: Dr. Wayne Curtis, Department of Chemical Engineering, the Pennsylvania State University, University Station, PA.

Co-sponsor: 1999 Summer Research Opportunities Program

The objective of this research is to directly demonstrate that the presence of root hairs on genetically transformed 'hairy root' cultures are a large contributor to fluid-flow resistance in liquid culture. The experimental system will be root cultures of *Hyoscyamus muticus* (T line). By adding the chemical 1-pyrenebutyric acid (PBA) it was previously shown in the lab that the root hairs would not form. This provides an experimental system where the same root cultures can be grown either with, or without root hairs. Another previous study has shown that the flow resistance in root cultures is much higher than expected, and it has been suggested that this high flow resistance is caused by the root hairs. By combining the 'hairy'/'hairless' culture system with an experimental apparatus to measure flow resistance, my project will attempt to make a direct correlation between root hairs and flow resistance.

Title: The Economic Impact of Highway Bypasses through Smaller Areas in Oklahoma

Shalonna Daniels, Junior, Management Information Systems, Oklahoma State University
Mentor: Dr. Finchum, Department of Geography, Oklahoma State University, Stillwater, OK

The intention of this project is to determine the economic impact of constructing highway bypasses in Oklahoma towns. We intend to discover what would happen to these areas. Will people move in or out? Will the current businesses stay? Would a bypass bring more business to these small towns? Some methods that will be used are researching past historical and economic data of areas in Oklahoma including population, traffic flow data, city and county tax collections, and socio-economic data to help determine the impact of a highway bypass system. When all of the data is gathered it will be put into a geographical information system (GIS) software package that will allow the Oklahoma Department of Transportation to predict the impact of highway changes and route alternatives.

Title: Effects of a Compressed, Natural Organic Humus, as a Soil Amendment, on Nitrogen and Phosphorus Levels and Microbial Populations.

Alan M. DeArman, Sophomore, Biology, University of Central Oklahoma

Mentor: Dr. David L. Elmendorf, College of Mathematics and Science, Department of Biology, University of Central Oklahoma, Edmond, OK

A compressed, natural organic humus is being studied for utilization as a soil amendment. Three treatments for growing Bermuda sod will be prepared, topsoil only, topsoil and a commercial soil amendment, and topsoil and compressed, natural organic humus amendment. Bermuda sod will be grown in potting trays, in triplicate for each treatment, and trays will be placed in growth chamber using randomized plot design. Growth chamber is maintained at 21⁰C, 14h light and 10h dark, and a humidity of 60 percent. Trays will be watered twice weekly with 500 ml of DI H₂O. After watering, runoff water is collected for chemical (ammonia, nitrate, nitrite, and phosphate) and microbiological analysis (standard plate count and fungal count). Nessler method is used to determine ammonia concentration, nitrate levels are determined by Cadmium Reduction procedure, nitrite levels are analyzed by Diazotization method, and Ascorbic Acid method is used to analyze phosphate levels in runoff water. Serial dilutions in 0.1% sodium pyrophosphate buffer (pH 7.0) and the spread plate procedure are utilized to determine standard plate counts on plate count agar and fungal counts on Czapek's agar. Preliminary results have determined the amount of the runoff water necessary for chemical and microbial analyses and dilutions necessary for chemical analyses. Initial concentrations in runoff water from topsoil, only, of NH₄, NO₃, NO₂, and PO₄ were high. After several weeks of Bermuda growth, these concentrations were dramatically reduced due to Bermuda utilization.

Title: Ecological Effects of Heavy Metals in Soils

Lisa Fields, Senior, Agronomy, Oklahoma State University

Mentor: Dr. Nicholas Basta, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK

The project will test the effects soils containing levels of cadmium, lead, zinc, and arsenic to lettuce growth and development. There are no baseline guideline for determining at what levels heavy metals effect the ecological components of soil and its derivatives, plant and living

organisms. The results should determine at what level amounts the heavy metal will effect the growth of lettuce.

Title: Developing a Reptilian Model for Endocrine Disrupting Chemical Analysis

Dwayne Gardner, Junior, Biological Sciences, Oklahoma State University

Mentor: Dr. Larry Talent, Arts & Sciences, Department of Zoology, Oklahoma State University, Stillwater, OK

The goal of my experiment is to develop a species of reptilian lizard that will stand as a model for future chemical analysis. Specifically, this summer I will be determining which species lay the largest eggs and determine which eggs hold the greatest amount of moisture. We allow the lizards to breed at night and the following day we check the females for egg or follicular formations. Currently, the lizard eggs and babies from Florida, Arkansas, and Oklahoma are not fairing well in captivity and their is a high number of unhatched eggs. Our other seven sub-species are fairing quite well, but more extensive research will be done on them.

Title: TBA (*Robert Henry never presented a title*)

Robert Henry, Senior, Industrial Engineering, Oklahoma State University

Mentor: Dr. Clint Christenson, Industrial Engineering and Management, Oklahoma State University, Stillwater, OK

The internship is in the field of energy management in manufacturing environments. One of the main tasks was participation in energy audits.

An energy audit is when a group travels to a manufacturing company and develops assessment recommendations to improve energy consumption, productivity improvements, and waste and water management. Also, research has been done on newer products available on the market. This updated product information can be used to find more efficient and cost-effective equipment to perform production tasks.

Title: Possible Worldwide Missourian-Virgilian Stratotype Boundary for the Upper Pennsylvanian in Northeastern Oklahoma.

Joseph Hall, Senior, Geology, Oklahoma State University

Mentor: Dr. Darwin R. Boardman, II, Oklahoma State University T. Boone Pickens School of Geology

A possible worldwide geologic correlation boundary between two geologic time periods exists in Northeastern Oklahoma. For the past 3 years, we have worked on identifying the faunal fossil content of this locality to pinpoint the boundary location and correlate it with other localities around the world. The project has been completed this summer and will be one of the focus points of an international paleontology symposium held at Oklahoma State University in mid-August, 1999.

Title: Pathogenic-fungal production of Beta-galactosidase in inoculated cantaloupe fruit.

Scott Linthicum, Junior, Biology, East Central University

**Mentors and Sponsors: Dr. Charles L. Biles and Dr. Terry Cluck
East Central University, Ada, OK**

Dr. B.D. Bruton and Dr. J.X. Zhang, USDA*ARS, Lane, OK

Didymella bryoniae, causal agent of gummy stem blight and black rot of cucurbits, is an economically important fungal pathogen. Previous experiments indicated that virulent isolates of *Didymella bryoniae* produced higher levels of Beta-galactosidase (Beta-Gal) than less virulent isolates. Beta-galactosidase (E.C. 3.2.123) is an exo-hydrolase that functions in the degradation of galactose-containing cell wall polysaccharides, releasing free galactose. This enzyme has been implicated in fruit softening and may aid the fungal pathogen in degeneration of cantaloupe tissue. HPLC cation-exchange chromatography of Beta-Gal from infested 10 day-old cantaloupe fruit and 10 day-old healthy fruit tissue showed a unique Beta-Gal isozyme of infested fruit when compared to healthy fruit. *D. bryoniae* grown in 1% pectin shake culture produced only one Beta-Gal anionic isozyme, which was similar in charge to the infested, fruit tissue sample. Size-exclusion chromatography of infected and healthy cantaloupe tissue showed that the Beta-Gal isozymes from infected and healthy tissue were similar in size. In contrast, the extracellular Beta-Gal isozyme from *D. bryoniae*-inoculated pectin culture filtrates was larger in size in the native confirmation. This data suggest that *D. bryoniae* produces additional Beta-Gal isozymes in fruit tissue when compared to shake culture, and the Beta-Gal isozymes are not from the fruit. Results from these experiments suggest that the cell wall-degrading enzyme, Beta-Gal, may be an important virulence factor of *D. bryoniae* in cantaloupe fruit black rot.

Title: Flower Constancy to Color in Honeybees (*Apis mellifera ligustica*) When Interfloral Distances are Varied

Luis Martinez, Sophomore, Biology, University of Tulsa

Mentor: Dr. Harrington Wells, Biology Department, University of Tulsa, Tulsa, OK

The specific intention of the project of the project is to determine if honey bees usually (of always) select the closest flower when foraging, regardless of color when they aren't forced to sample all morphs (of pedicellate artificial flowers) prior to testing.

Title: Application of a Photo Refractometer

Patrick McLean, Junior, Electrical Engineering Technology, Oklahoma State University

Mentor: Dr. Jerzy Krasinski, Electrical and Computer Engineering, Stillwater, OK

The photo refractometer that I will be developing will shine a light into a MOCVD reactor chamber and be reflected off of a crystal and back into the device. The reflection of light from the semiconductor material is strongly related to the surface condition, the sample thickness, the wavelength of light, the sample temperature, and the environment condition inside of the reactor. For example, using the reflection of light with the different color, we can obtain the thickness change and the thickness itself of the sample at the same time during the crystal growth.

Once this in-situ signal is obtained it will be analyzed to determine several aspects of crystal growth. This data will be digitized and saved for the post-growth analysis. Hopefully, with the development of this apparatus, it will be extended to one systemized apparatus, which can be used for general MOCVD operations.

Title: Anaerobic Filter Bed to Precipitate Iron

Victoria Orrostieta, Senior, Biology, University of Tulsa

Mentor: Dr. Thomas Harris, College of Engineering, Department of Chemistry, University of Tulsa

The purpose of this project is to research the effectiveness of an anaerobic filter bed in precipitating iron. If this bed is successful, it may be applied to treat acid mine drainage in the Tar Creek area of Ottawa County, Oklahoma. The variables that will be tested include the effects of pH, iron-sulfate ratio, layer thicknesses, and flow rate. The concentration of iron and other ions will be measured using an atomic absorption spectrophotometer and an ion chromatograph, respectively. To date, we have focused mainly on the design of the bed and will begin testing variable this week.

Title: Comparison Of Measured Crop Yield and Its Projected Yield as Generated by EPICView

Tonishia Owens, Junior, Biochemistry, Oklahoma State University

Mentor and Co-Sponsor: Dr. David Waits, Asst. Prof. Oklahoma State

University.,President. SST Incorporated. GIS Hydrology and Water Resources REU

Summer Program

This was a field experience focusing on the technology of GIS and the multi-applications of it in science and abroad. The project compared measured crop yields to projected crop yields, as generated by the EPIC(Erosion/Production Impact Calculator) model.

Title: Possible Defense Related Enzymes of Cantaloupe Fruit: Characterization of Chitobiase.

Tracy Pardue, Junior, Biology, East Central University

Mentors and Co-Sponsors: Dr. Charles L. Biles and Dr. Terry Cluck

East Central University, Ada, OK

Dr. B.D. Bruton and Dr. J.X. Zhang, USDA*ARS, Lane, OK

Cantaloupe fruit is highly perishable after harvest due to postharvest fungal pathogens. These pathogens invade the fruit during net development and remain dormant (latent) until fruit maturity. The induction of latency and the stimulation to continue infection at fruit maturity is poorly understood. One hypothesis is that fruit defense enzymes are present early in fruit development but, decrease in activity as the fruit matures, therefore, rendering the fruit more susceptible to fungal pathogens. Chitinase and chitobiase (N-acetyl glucosaminidase) have been found in several plant and fungal species and are implicated as having antifungal activity. Chitobiase activity was observed in mesocarp and exocarp tissue with the highest activity in fruit exocarp (peel) tissue 5 and 50 days after anthesis. HPLC anion exchange chromatography of the 5 day tissue showed two chitobiase peaks, while the 50 day old fruit tissue showed only one. Fractions from the anion*exchange column were applied to a size*exclusion column (SEC) which indicated one peak of chitobiase activity. This peak suggest the presence of a single chitobiase isozyme in 50 day old fruit tissue. SDS-PAGE of the chitobiase fraction will be conducted to determine the molecular weight of the exocarp chitobiase. Isolation and genetic manipulation of the genes for chitinase and chitobiase may provide greater protection against postharvest fungal pathogens.

Title: Software Utilizing Design Patterns To Create Web-based Interfaces:

Curtis Shavers, Computer Engineering, Oklahoma State University

Mentor: Dr. Rose Gamble, Mathematical and Computer Sciences, University of Tulsa, Tulsa, OK

The focus was to utilize Software Design Patterns to create web-based interfaces to existing software. The expectation was to participate in the implementation of a web-based interface to IHArch 2.0, a software integration analysis tool. The interface is written in conjunction with the new IHArch implementation in Java. The interface itself is implemented in Java or Superscape's 3D Webmaster.

Title: Integrating Structures and Quality Control
Quentin Smith, Engineering, Oklahoma State University

Mentor: Dr. Jerry Speir, CEAT, Stillwater, Oklahoma

The research consisted of assessing Payne and Okmulgee County bridge structures. These were compared to standard bridge designs and redesigned using "pro-e" which is a 3-d CAD program.

Title: An Advanced Agent for Legal Research

Daniel Wilson, Senior, Department of Mathematical and Computer Sciences, University of Tulsa

Mentor: Dr. Sandip Sen, Department of Mathematical and Computer Sciences, University of Tulsa, Tulsa, OK

Computers have radically changed how we store and retrieve information. Mass amounts of information have been digitized and are now stored not in libraries, but within vast databases accessible only through computers. The days of walking through libraries are ending; today we must often rely upon computers to do this for us as well. Unfortunately, the process of asking a computer for information is often tiresome and fruitless. Due to the incredible amount of case information required during legal research this problem is especially significant to lawyers. Our research seeks to solve this problem through the use of intelligent agents. Our intelligent agent is a computer program with the ability to learn from users and to choose its actions accordingly. When given a law-related search query it does more than simply return word matches, it also uses current and past user interests to tailor the results. It returns not only what the user's preferences suggest, but what past users have also found useful. The task of navigating through huge amounts of computer information can be facilitated with the use of our intelligent guide.

Title: A Comparison of Attitudes and Performance Between Undergraduate Students in an Introductory Astronomy Class and Public School Teachers Taking an Astronomy Workshop

Monalita Wright, Post-Baccalareate Bridge Program, B.S. Physics, 1999, East Central University

Mentors: Dr. Carl T. Rutledge & Dr. Karen A. Williams, Department of Physics, East Central University, Ada

This project will examine several aspects of astronomy education. It will determine:

1. If taking an astronomy course in the summer increases students' attitudes toward science
2. If Native Americans have significantly different attitudes toward science

3. Whether teachers have significantly different attitudes than students
4. If teachers have significantly different gains in a workshop setting from students in a traditional astronomy course.

Pre-tests have been administered, but no conclusions can be reached until both the workshop and the astronomy course are over.

Appendix

SCHOLAR'S PROGRAM ACTIVITIES

- Orientation
- retention assessment
- weekly cadre meetings
- monthly status reports
- tutoring
- monthly scholars meetings
- research mentoring
- graduate portfolio classes

MENTORING COMPONENT

- develop outline of research activities
- weekly research with mentor
- progress/summary report
- mentor evaluation

CADRE ACTIVITIES

- career center to explore graduate schools on computers
- monthly and semester schedules
- resumes and vitas
- scholarship and internship applications
- note-taking process
- test taking skills

GRADUATE PORTFOLIO CLASS

- monthly classes
- research graduate programs
- GRE preparation
- develop timelines
- develop resume
- statement of purpose
- mock interviews