CURRICULUM VITAE

NANCY L. PAIVA, PH.D.

Associate Professor of Chemistry
Department of Chemistry, Computer, and Physical Sciences
Medical Center of Southeastern Oklahoma Endowed Professor in Biomedical Sciences
Southeastern Oklahoma State University
425 W. University Blvd., Science 216
Durant, OK 74701-0609
Office Phone: (580) 745-2324 FAX: (580) 745-7494
npaiva@se.edu

EDUCATION

1988 **Ph.D.** - Biochemical Engineering — Massachusetts Institute of Technology, Cambridge, Massachusetts

Thesis title: Biosynthesis of Rapamycin by *Streptomyces hygroscopicus*.
Ph.D. advisor: Prof. A.L. Demain, Dept. of Applied Biological Sciences/Biology

1981 **B.S.** - Chemistry — Harvey Mudd College, Claremont, California

Senior thesis topic: Characterization of two forms of acetylcholine esterase from torpedo fish (*Torpedo californica*).

ACADEMIC AND RELATED NON-ACADEMIC EXPERIENCE

2006-present	Associate Professor of Chemistry	Southeastern Oklahoma State University, Department of Chemistry, Computer, and Physical Sciences, Durant, OK
2002-2006	Assistant Professor of Chemistry	Southeastern Oklahoma State University
1996-2002	Associate Staff Scientist	The Samuel Roberts Noble Foundation, Inc., Plant Biology Division, Ardmore, Oklahoma
1990-1996	Assistant Staff Scientist	The Samuel Roberts Noble Foundation, Inc.
1989-1990	Postdoctoral Fellow	The Samuel Roberts Noble Foundation, Inc.
1987-1989	Postdoctoral Research Associate	Plant Biotechnology Institute, NRC-Canada, Saskatoon, Saskatchewan, Canada
1981-1987	Graduate Research Assistant Graduate Teaching Assistant	Massachusetts Institute of Technology, Cambridge, Massachusetts Department of Applied Biological Sciences (Department of Nutrition & Food Sciences)

1982-1987	MacGregor Dormitory Graduate Resident (social and academic counseling of undergraduates)	Massachusetts Institute of Technology, Cambridge, Massachusetts, Dean of Students Office
1980-1981	Women's Proctor (peer counseling of undergraduates)	Harvey Mudd College, Claremont, California, Dean of Students office

PROFESSIONAL INTERESTS

Academic Specialty

Biochemistry
Molecular Biology
Natural Products Chemistry

Research Interests

Investigation and genetic manipulation of the biosynthesis of natural products in an undergraduate teaching and research environment.
Assessing the role of natural products in producing and consuming organisms.
Structural characterization and identification of organic molecules.
Biofuels production.
Industrial microbiology.
Developing laboratory and industry internships for undergraduates.

SELECTED COMMITTEES AND SPECIAL ASSIGNMENTS

At Southeastern Oklahoma State University

2017-present	Organized Research and Program Review Committee (appointed for August 2017 to August 2019; renewed August 2019)
2005-present	Faculty Advisor for the Southeastern Oklahoma State University Chapter of the American Chemical Society (ACS) Student Members (formerly Student Affiliates)
2014-present	Faculty Co-Advisor for the Southeastern Oklahoma State University Chapter of the American Indian Science & Engineering Society (AISES)
2002-present	Campus representative for Southeastern Oklahoma State University to the National Aeronautics and Space Administration (NASA) Oklahoma Space Grant Consortium (OSGC) (Lead office is now at OSU, Stillwater campus)
2009-present	Campus representative for Southeastern Oklahoma State University to the statewide NIH-OK-INBRE committee (Lead office is at OUHSC, OKC campus)
2002-present	Faculty Chemical Stock and Safety Review Committee
2012-2015	Retention and Graduation Action Team member
2011-2015	Campus representative for Southeastern Oklahoma State University to the statewide OK NSF EPSCoR Broader Impacts Committee (Lead office is at OSU, Stillwater campus); outreach project coordinator

2009-2012 Director of Biotechnology major-minor program (separate program terminated, and modified degree plan re-introduced as a Chemistry major-minor degree plan)
2005-2006 President's 2010 Funding Strategic Goal Team

At Samuel Roberts Noble Foundation

1990-2002 Plant Biology Division Safety and Radiation Usage Committees
1990-2002 Numerous divisional and interdivisional staff search committees
1998-2000 Greenhouse Oversight Committee Meeting (interdivisional committee)
1995-1998 Forage Biotechnology/Plant Biology interface group

AWARDS AND HONORS

2006- present Medical Center of Southeastern Oklahoma Endowed Professorship in Biomedical Sciences
2007- present Outstanding Chapter Award (2015-2016), Commendable (2012-2013), and Honorable mention (2007, 2009 -2012, and 2017) for American Chemical Society student chapter activities (as chapter co-advisor/advisor)
2004-2005, 2011-2012 & 2012-2013 Southeastern Oklahoma State University Faculty Senate Faculty Recognition Award for Excellence in Scholarship and Research, School of Arts and Sciences

PROFESSIONAL MEMBERSHIPS

American Chemical Society (ACS professional member)
American Association for the Advancement of Science (AAAS)
American Society for Microbiology (ASM)
American Society of Plant Biologists (formerly Physiologists)
Council for Undergraduate Research (CUR)
Phytochemical Society of North America
American Indian Science and Engineering Society (AISES) (professional, non-voting member to serve as undergraduate chapter mentor)

EFFECTIVE TEACHING

Courses Developed at SOSU:

Molecular Genetics lecture and laboratory (CHEM/BIOL 4124), 6.5 semesters since 2003 (course created primarily for Biotechnology/Biochemical Technology major-minors, but used as an upper-level elective)
Chemical Concepts (CHEM1004), 15 Spring/Fall semesters and 2 Summer semesters continuously, then 3 year gap until resuming in Fall 2020 with new format (1-semester course created primarily for pre-nursing candidates and non-science majors; also covers General Education requirement for 1 credit of Physical Science; allowed removal of non-Chemistry majors from CHEM 1315 sections)
Introduction to Research (now CHEM2212); new offering since Spring 2016 courselist; formerly offered as CHEM4972: Special Studies: Introduction to Research. Offered Spring 2014 and Summer 2014, using NSF OK EPSCoR external grant support, and Spring 2015, 2017, 2018 and Summer 2015 as Arranged courses.
Advanced Protein Techniques (CHEM 4972), 2 semesters (newly created course in 2005, using NSF-MRI equipment grant)

Biofuels Technology (as arranged course under CHEM 4972), 1 semester (newly created course, using research grant-funded materials)

Bio-Active Natural Products (as arranged course/special studies under CHEM 4972 & CHEM 5972.88), 1 semester (newly created course, using research materials and mainly review articles, with doing searching current literature for reports)

Courses Taught at SOSU (in addition to above developed courses):

Biochemistry (I) lecture and laboratory (CHEM 4115): made major changes to course structure and laboratory in and since 2002, particularly use of protein purification and analysis instrumentation in laboratory, using NSF-MRI equipment grant and supplies from several other research grants), 17 semesters through 2020

General Chemistry I lecture and laboratory (CHEM 1315), 8 semesters (4 semesters Fall 2003 to Spring 2004, Fall 2016 to Fall 2019)

General Chemistry II lecture and laboratory (CHEM 1415), 5 semesters (Spring 2015, 2017, 2018, 2019, 2020)

Organic Chemistry/Biochemistry (CHEM2014, for Science Ed.): 1 semester (Fall 2014)

Chemical Literature (CHEM2311): Spring 2016

General Physical Sciences lecture (PSCI 1114), 16 semesters/multiple sections (General Education course for non-science majors)

Biochemistry II/Metabolism (CHEM/BIOL 4193), 15 semesters

Senior Seminar (CHEM 4951), 3 semesters (including Fall 2020)

*Research Experience for Credit (CHEM 4990), over 45 students, 1 to 8 per term including summers

*Directed Reading (CHEM 4960), multiple topics and students, (usually CHEM minors)

*Special Studies (CHEM 4970), multiple topics

*=*the latter 3 courses are generally taught for no teaching load credit or pay*

Honors Program Courses Taught at SOSU:

SCIE4521 Scientific Thought (Spring 2008 & 2009)

Honors contracts with students in CHEM 4115 Biochemistry (Fall 2006 and 2013) and CHEM4193 Biochemistry II (Spring 2014), CHEM1004 (2015 for 1 Freshman), and under revised Honors program criteria CHEM4990 (Fall 2018 for 2 Juniors).

Graduate Program Courses Taught at SOSU:

Molecular Genetics lecture and laboratory (BIOL 5124 in Fall 2010, and CHEM/BIOL 4124 in Fall 2003 for graduate credit for multiple graduate students). Biochemistry I lecture and lab (CHEM 4115/5975 in Fall 2011 for 1 student, in Fall 2014 for 1 student, and in Fall 2015 for 2 students) Biochemistry II (CHEM4193 as CHEM5973) for 2 graduate students.

Courses Taught at MIT:

Industrial Microbiology laboratory (2 semesters: 1983, 1984)

Biochemical Techniques laboratory (1 semester: 1986)

Curricular Changes Initiated at SOSU:

Initiated request for and received approval from state regents for modifications to Biotechnology major-minor program, changing Organic Chemistry II from a requirement to one of several possible technology-related electives, which increased degree plan completion.

Worked with students and program managers to get research credits for internships at local industrial laboratories and regional research laboratories.

In addition to other new courses developed at SOSU, initiated drive to split the single introductory chemistry course into multiple tracks (now 3) to separate nurses requiring only 1 semester (in CHEM1004 Chemical Concepts) or other students requiring only 2 smesters (in Basic Chemistry I&II) from chemistry majors and minors in General Chemistry I&II. I have been told by observers at SE that this greatly improved retention of students in their respective courses. Due to high success rate of CHEM 1004 students in ECU@SE Nursing program, Dean of Science at ECU was recently requesting that ECU Chemistry develop a similar course.

Initiated development of an Introduction to Research (CHEM2212) course aimed at lower-level students, which after 2 CHEM 4972 workshops funded by OK-NSF-EPSCoR was added to the catalog offerings in 2016. I have also been investigating the incorporation of open-ended, research style labs into core lab courses, in line with OK-INBRE statewide goals and national trends (continuing process). I have had Biochemistry I lab and Molecular Genetics students work with the purification and DNA sequence analysis of my research samples (16S ITS rRNA sequences), but would like to see more research-style labs integrated into Gen Chem II.

PATENTS

"Genetic Manipulation Of Condensed Tannins", R.A. Dixon, N.L. Paiva, D. Xie, and S. Sharma, provisional patent application submitted July 2002; issued in foreign countries beginning in 2008; US Pat. #7622638 Issue Date: November 24, 2009.

"Transgenic Plants Modified to Contain Resveratrol Glucoside and Uses Thereof ", N.L. Paiva and J.D. Hipskind, US Pat. #6,974,895, final patent application submitted January 2000; issued December 13, 2005.

"Isoflavone Reductase Promoter", R.A.Dixon, N.L.Paiva, A.Oommen, Pat. #5,750,399, issued May 12, 1998.

PUBLICATIONS (peer-reviewed journal articles and book chapters)

Paiva, N.L. (2010) Chapter 14: Plant Cell Culture. (book chapter) In: Manual of Industrial Microbiology and Biotechnology, 3rd edition, R.H.Baltz, J.E.Davies and A.L.Demain, eds., ASM Press, Washington DC, pp.115-131.

Kineman, B.D., Brummer, E.C., Paiva, N.L., Birt, D.F. (2010) Resveratrol from transgenic alfalfa for prevention of aberrant crypt foci in mice. Nutrition and Cancer **62**: 351-361.

Kineman, B.D., Au A., Paiva, N.L., Kaiser, M.S., Brummer, E.C., Birt, D.F. (2007) Transgenic alfalfa that accumulates piceid (trans-resveratrol-3-O-beta-D-glucopyranoside) requires the presence of beta-glucosidase to inhibit the formation of aberrant crypt foci in the colon of CF-1 mice. Nutrition and Cancer **58**: 66-74.

Aziz, N., Paiva N.L., May G.D., Dixon R.A. (2005) Transcriptome analysis of alfalfa glandular trichomes. Planta **221**: 28-38. [E-publication, Dec 2, 2004, DOI: 10.1007/s00425-004-1424-1]

Xie, D.-Y., Jackson, L.A., Cooper, J.D., Ferreira, D., and Paiva, N.L. (2004) Molecular and Biochemical Analysis of Two cDNA Clones Encoding Dihydroflavonol-4-Reductase from *Medicago truncatula*. Plant Physiology **134**: 979-994.

Xie, D., Sharma, S.B., Paiva, N.L., Ferreira, D., Dixon, R.A. (2003) Role of anthocyanidin reductase, encoded by BANYULS in plant flavonoid biosynthesis. Science **299**: 396-399.

Cooper, J.D., Qiu, F. and Paiva, N.L. (2002) Biotransformation of an exogenously supplied isoflavonoid by transgenic tobacco cells expressing alfalfa isoflavone reductase, Plant Cell Reports **20**: 876-884.

Baggett, B.R., Cooper, J.D., Hogan, E.T., Carper, J., Paiva, N.L., and Smith, J.T. (2002) Profiling isoflavonoids found in legume root extracts using capillary electrophoresis. Electrophoresis **23**: 1642-1651.

Paiva, N.L. (2002). Engineering Resveratrol Glucoside Accumulation Into Alfalfa: Crop Protection and Nutraceutical Applications, IN: Crop Biotechnology, American Chemical Society Symposium Series 829. Edited by K. Rajasekaran, T.J. Jacks, and J.W. Finley, American Chemical Society, Washington, DC, published by Oxford University Press. p. 118-130.

López-Meyer, M. and Paiva, N.L. (2002) Immunolocalization of vestitone reductase and isoflavone reductase, two enzymes involved in the biosynthesis of the phytoalexin medicarpin. Physiological and Molecular Plant Pathology **61**: 15-30.

Paiva, N.L., and Hipskind, J.D. (2001) Resveratrol Glucoside Engineering: Plant And Human Health Benefits. IN: Recent Advances in Phytochemistry: Regulation of Phytochemicals by Molecular Techniques, Volume 35, J. Romeo and J. Saunders, eds., Phytochemical Society of North America, Elsevier Inc., pp.233-255.

Mundodi, S.R., Watson, B.S., Lopez-Meyer, M., and Paiva, N.L. (2001) Functional expression and subcellular localization of the *Nectria haematococca Mak1* phytoalexin detoxification enzyme in transgenic tobacco. Plant Molecular Biology **46**: 421-432.

Bell, C.J., Dixon, R.A., Farmer, A.D., Flores, R., Inman, J., Gonzales, R.A., Harrison, M.J., Paiva, N.L., Scott, A.D., Weller, J.W., and May, G.D. (2001) The Medicago Genome Initiative: a model legume database. Nucleic Acids Research **29**: 114-117.

Hipskind, J.D., and Paiva, N.L. (2000) Constitutive accumulation of a resveratrol glucoside in transgenic alfalfa increases resistance to *Phoma medicaginis*. Molecular Plant-Microbe Interactions **13**: 551-62.

Allen, D.J., Gray, J.C., Paiva, N.L., and Smith, J.T. (2000) An enantiomeric assay for the flavonoids medicarpin and vestitone using capillary electrophoresis. Electrophoresis **21**: 2051-

2057.

Paiva, N.L. (2000) An Introduction to the Biosynthesis of Chemicals Used in Plant-Microbe Communication. Journal of Plant Growth Regulation **19**: 131-143.

Paiva, N.L. (1999) Plant Cell Culture. (book chapter) In: Manual of Industrial Microbiology and Biotechnology, 2nd edition, A.L.Demain and J.E.Davies, eds., ASM Press, Washington DC, pp.192-206.

Cameron, R.K., Paiva, N.L., Lamb, C.J., and Dixon, R.A. (1999) Accumulation of salicylic acid and PR-1 gene transcripts in relation to the systemic acquired resistance (SAR) response induced by *Pseudomonas syringae* pv. tomato in Arabidopsis. Physiological and Molecular Plant Pathology. **55**: 121-130.

Paiva, N.L., Hipskind, J.D., and Cooper, J.D. (1999) Alfalfa transformation related to secondary metabolite biosynthesis, Proceedings of The Alfalfa Genome (TAG) meeting, August 1-4, 1999, Madison, Wisconsin.
http://genes.alfalfa.ksu.edu/TAG/TAGpapers/paiva/PAIVA.html
McKhann, H.I., Paiva, N.L., Dixon, R.A., and Hirsch, A.M. (1998) Expression of genes for enzymes of the flavonoid biosynthetic pathway in the early stages of the Rhizobium-legume symbiosis. In: Flavonoids in the Living System, Manthey and Buslig, eds., Plenum Press, New York, NY, pp.45-54.

Lopez-Meyer, M., and Paiva, N.L. (1998) Subcellular localization of two enzymes involved in medicarpin biosynthesis in alfalfa. 36th North American Alfalfa Improvement Conference Proceedings, p. 43.

McKhann, H.I., Paiva, N.L., Dixon, R.A., and Hirsch, A.M. (1997) Chalcone synthase transcripts are detected in alfalfa root hairs following inoculation with wild-type *Rhizobium meliloti*. Molecular Plant-Microbe Interactions **10**: 50-58.

Dixon, R.A., Lamb, C.J., Masoud, S., Sewalt, V.J. and Paiva, N.L. (1996) Metabolic engineering: Prospects for crop improvement through the genetic manipulation of phenylpropanoid biosynthesis and defense responses. Gene **179**: 61-71.

Sumner, L.W., Paiva, N.L., Dixon, R.A., and Geno, P.W. (1996) High-performance liquid chromatography/continuous-flow liquid secondary ion mass spectrometry of flavonoid glucosides in leguminous plant extracts. Journal of Mass Spectrometry **31**: 472-485.

Pallas, J.A., Paiva, N.L., Lamb, C.J., and Dixon, R.A. (1996) Tobacco plants epigenetically suppressed in phenylalanine ammonia-lyase do not develop systemic acquired resistance in response to infection by tobacco mosaic virus. Plant Journal **10**: 281-293.

Dixon, R.A., Lamb, C.J., Paiva, N.L., and Masoud, S. (1996) Improvement of natural defense responses. Annals of the New York Academy of Sciences. **792**: 126-139.

Bianchini, G.M., Stermer, B.A., and Paiva, N.L. (1996) Induction of early mevalonate pathway enzymes and biosynthesis of end products in potato (*Solanum tuberosum* L.) tubers by wounding and elicitation. Phytochemistry **42**: 1563-1571.

Howles, P.A., Sewalt, V.J.H., Paiva, N.L., Lamb, C.J., Elkind, Y., Bate, N.J., and Dixon, R.A. (1996) Overexpression of phenylalanine ammonia-lyase in transgenic tobacco plants reveals control points for flux into phenylpropanoid synthesis. Plant Physiology **112**: 1617-1624.

Guo, L., and Paiva, N.L. (1995) Molecular cloning and expression of alfalfa (*Medicago sativa* L.) vestitone reductase, the penultimate enzyme in medicarpin biosynthesis. Archives of Biochemistry and Biophysics **320**: 353-360.

Dixon, R.A., and Paiva, N.L. (1995) Stress-induced phenylpropanoid metabolism. Plant Cell **7**: 1085-1097.

Dixon, R.A., Bhattacharyya, M.K., and Paiva, N.L. (1995) Engineering disease resistance in plants: an overview. In "Advanced Methods in Plant Pathology", Singh, R.P. and Singh, U.S., eds., CRC Press, Boca Raton, pp 249-270.

Bhattacharyya, M.K., Paiva, N.L., Dixon, R.A., Korth, K.L., and Stermer, B.A. (1995) Features of the *hmg1* subfamily of genes encoding HMG-CoA reductase in potato. Plant Molecular Biology, **28:** 1-15.

Ni, W., Paiva, N.L., and Dixon, R.A. (1994) Reduced lignin in transgenic plants containing an engineered caffeic acid O-methyltransferase antisense gene. Transgenic Research **3**: 120-126.

Paiva, N.L., Sun, Y., Dixon, R.A., VanEtten, H.D., and Hrazdina, G. (1994) Molecular cloning of isoflavone reductase from pea (*Pisum sativum* L.): Evidence for a 3R-isoflavone intermediate in (+)-pisatin biosynthesis. Archives of Biochemistry and Biophysics **213**: 501-510.

Paiva, N.L., Oommen, A., Harrison, M.J., and Dixon, R.A. (1994) Regulation of isoflavonoid metabolism in alfalfa. Plant Cell, Tissue and Organ Culture **38:** 213-220. (also published in "Primary and Secondary Metabolism of Plants and Cell Cultures III", (1995) Schripsema, J. and Verpoorte,R., eds., Kluwer Academic Publishers, Boston, pp 213-220.)

Oommen, A., Dixon, R.A., and Paiva, N.L. (1994) The elicitor-inducible alfalfa isoflavone reductase promoter confers different patterns of developmental expression in homologous and heterologous transgenic plants. Plant Cell **6**: 1789-1803.

Guo, L., Dixon, R.A., and Paiva, N.L. (1994) Conversion of vestitone to medicarpin in alfalfa (*Medicago sativa* L.) is catalyzed by two independent enzymes. Journal of Biological Chemistry **269**: 22372-22378.

Guo, L., Dixon, R.A., and Paiva, N.L. (1994) The pterocarpan synthase of alfalfa: Association and co-induction of vestitone reductase and 7,2'-dihydroxy-4'-methoxy-isoflavanol (DMI) dehydratase, the two final enzymes in medicarpin biosynthesis. FEBS Letters **356**: 221-225.

Dixon, R.A., Paiva, N.L., and Harrison, M.J. (1994) Biochemical and molecular analysis of defense responses in legumes: an overview. Proceedings of the 1st European Nitrogen Fixation Conference, eds G.B. Hiss and G. Endre, Officing Press, Szeged, pp 195-198.

Dixon, R.A., Harrison, M.J., and Paiva, N.L. (1994) The isoflavonoid phytoalexin pathway: from enzymes to genes to transcription factors. Physiologia Plantarum **93**: 385-392.

Dixon, R.A., Bhattacharyya, M.K., Harrison, M.J., Faktor, O., Lamb, C.J., Loake, G.J., Ni, W., Oommen, A., Paiva, N., Stermer, B., and Yu, L.M. (1993) Transcriptional regulation of phytoalexin biosynthetic genes. In "Advances in Molecular Genetics of Plant-Microbe Interactions", Vol. 2, Nester, E.W. and Verma, D.P.S., eds., Kluwer Academic Publishers, Dordrecht, Netherlands, pp 497-509.

Blount, J.W., Dixon, R.A., and Paiva, N.L. (1993) Stress responses in alfalfa (*Medicago sativa* L.) XVI. Antifungal activity of medicarpin and its biosynthetic precursors; implications for the genetic manipulation of stress metabolites. Physiological and Molecular Plant Pathology **41**: 333-349.

Dixon, R.A., Harrison, M.J., Paiva, N.L., and Stermer, B.A. (1993) Molecular biology of disease resistance. In "Biotechnology for Aridland Plants", Mabry, T., Nguyen, H., Dixon, R.A. and Bonness, M., eds., IC^2 Institute, Austin, Texas, pp 177-203.

Dixon, R.A., Maxwell, C.A., Ni, W., Oommen, A., and Paiva, N.L. (1993) Genetic manipulation of lignin and phenylpropanoid compounds involved in interactions with microorganisms. In "Recent Advances in Phytochemistry", Vol. 28, Genetic Engineering of Plant Secondary Metabolism, Ellis, B.E., Kuroki, G.W. and Stafford, H.A., eds. Plenum, New York, pp 153-178.

Dixon, R.A., and Paiva, N.L. (1992) Prospects for accessing DNA banks for the isolation of genes encoding biologically active proteins. In, "Conservation of Plant Genes. DNA Banking and *In Vitro* Technology", Adams, R.P. and Adams, J.E., eds. Academic Press, New York, pp 99-118.

Dixon, R.A., Choudhary, A.D., Dalkin, K., Edwards, R., Fahrendorf, T., Gowri, G., Harrison, M.J., Lamb, C.J., Loake, G.J., Maxwell, C.A., Orr, J.D., and Paiva, N.L. (1992) Molecular biology of stress-induced phenylpropanoid biosynthesis in alfalfa. In, "Phenolic Metabolism in Plants", Stafford, H.A. and Ibrahim, R.K. eds., Plenum Press, New York, pp 91-138.

Gowri, G., Paiva, N.L., and Dixon, R.A. (1991) Stress responses in alfalfa (*Medicago sativa* L.) XII. Sequence analysis of phenylalanine ammonia-lyase (PAL) cDNA clones and appearance of PAL transcripts in elicitor-treated cell cultures and developing plants. Plant Molecular Biology **17**: 415-429.

Paiva, N.L., Edwards, R., Sun,Y., Hrazdina, G., and Dixon, R.A. (1991) Stress responses in alfalfa (*Medicago sativa* L.) XI.Molecular cloning and expression of alfalfa isoflavone reductase, a key enzyme of isoflavonoid phytoalexin biosynthesis. Plant Molecular Biology **17**: 653-667.

Kurz, W.G.W., Paiva, N.L., and Tyler, R.T. (1990) Production of sanguinarine by the elicitation of surface immobilized *Papaver somniferum* L. plant cells. In "Proceedings of the VIIth International Congress on Plant Tissue Culture", eds. Nijkamp, H.J.J., van der Plas, L.H.W. and van Aartrijk, J. pp 682-688.

Paiva, N.L., Demain, A.L., and Roberts, M.F. (1993) The immediate precursor of the nitrogen-containing ring of rapamycin is free pipecolic acid. Enzyme and Microbial Technology **15**: 581-585.

Paiva, N.L., Roberts, M.F., and Demain, A.L. (1993) The cyclohexane moiety of rapamycin is derived from shikimic acid in *Streptomyces hygroscopicus*. Journal of Industrial Microbiology **12**: 423-428.

Paiva, N.L., Roberts, M.F., and Demain, A.L. (1991) Incorporation of acetate, propionate, and methionine into rapamycin by *Streptomyces hygroscopicus*. Journal of Natural Products, **54**: 167-177.

Brana, A.F., Paiva, N.L., and Demain A.L. (1986) Pathways and regulation of ammonium assimilation in *Streptomyces clavuligerus*. Journal of General Microbiology **132**: 1305-1317.

SELECTED PRESENTATIONS

Selected significant Presentations at meetings without research students present:

December 2015: Pacifichem (a joint meeting of the American Chemical Society and several international chemical societies of the Pacific Rim): poster presented December 18, 2015, Honolulu, HI: Topic Area: (11) Connecting Chemistry to Society
Session Title: Active and Inquiry Learning in the Chemistry Classroom and Laboratory (#443)
Abstract Title: "Introductory biochemical technology lab to help chemistry, environmental science, and biology students explore microbes in different environments." This was my first time presenting in an Educational section, presenting results generated in the first offerings of Introduction to Research offered under OK NSF EPSCoR workshop funding, among faculty presenting courses or workshops that they developed at their home institutions.

Spring 2012: "Filamentous freshwater biomass as a bioenergy source", Poster presented by **Paiva, Nancy L.**; Jones, Stefan T.; Assamoi, Tetchi H.; Zounon, Judith; McKim, Steve. 243rd ACS National Meeting & Exposition, San Diego, CA, March 25-29, 2012 (BIOT-235).

Spring 2011: "Analysis of phytochemicals in a traditional herbal remedy for BPH", Poster presented by **Paiva, Nancy L**.; Baughman, Allen; Jones, Stefan T.; Faull, Kym F.; Villamil, Aris. 241st ACS National Meeting & Exposition, Anaheim, CA, March 27-31, 2011 (AGFD-130).

2009 OK-NSF-EPSCoR Annual Statewide meeting, Oklahoma City, March 31, 2009, (on nanotechnology and biofuels): presented technical poster: Dale W. Daniel, Tucker Harrison, Kati Crawford, Michael C. Pilkington, & **Nancy L. Paiva**, "*Centaurea americana* as a Potential Biodiesel Oilseed Crop", summarizing multiple years of funded research findings. (also

attended 2011 OK-NSF-EPSCoR Annual Statewide meeting, Norman-OU campus, April 21, 2011)

Additional scientific and progress report presentations were made at annual meetings called by NASA Oklahoma Space Grant, OK-INBRE, and OK NSF EPSCoR research and grant sponsors.

American Chemical Society national meetings: Posters co-authored and presented by students (*Abstracts listed in SciFinder database***).**

In each of the years listed, as the SE ACS chapter faculty advisor, I also helped the chapter members apply to the ACS National Office in Washington D.C. for a $300 group travel grant and to SE Student Government Association for $100-$200 per student, in addition to arranging other travel funds, transportation, lodging, registration and meals.

Spring 2018, New Orleans, LA, March 2018. (2 co-authored posters presented, plus escorted 1 undergraduate non-coauthor presenting summer work):

1) CHED ACS Student Affliliates "Successful Chapter" poster, Casey Love, Dyani Shores, Elizabeth Whitlow, and Payton Whitehead presenting. 2) CHED-Undergraduate research posters- Comparison of growth and energy content of Spriodela polyrhiza and Lemna minor, two potential biofuel sources. Ryan M. Robinson, Payton S. Whitehead, Patrick W. Sharp, Steve McKim, , Nancy L. Paiva.

Spring 2017, San Francisco, CA, April 2017: 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), Payton Whitehead, E. Landers, L. Chandler, and N.L. Paiva; **Payton Whitehead** presenting.

Spring 2016, San Diego, CA, March 2016: 1) CHED ACS Student Affliliates "Successful Chapter" poster, E. Landers, L. Chandler presenting; 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on *E. coli* expression of a *Medicago truncatula* cDNA-encoded anthocyanin reductase (ANR), **Ludmila Chander** presenting.

Spring 2014, Dallas TX (2 abstracts submitted): 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on duckweed to biofuels research, with 2 student presenters.

Spring 2013, New Orleans, LA (2 abstracts submitted): 1) CHED ACS Student Affliliates "Successful Chapter" poster, 2) CHED-Undergraduate research posters- Biotechnology section technical research poster on duckweed to biofuels research.

Spring 2012, San Diego, CA (2 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) BIOT (Biochemical Technology) technical research poster on biofuels from aquatic biomass. The later was selected for presentation at both the BIOT session as well as the "Sci-Mix" interdisciplinary session.

Spring 2011, Anaheim, CA (3 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) AGFD technical research poster, & 3) escorting biotechnology major presenting poster on their Noble Foundation (Ardmore, OK) summer 2010 internships

Spring 2010, San Francisco, CA (3 abstracts submitted): 1) ACS Student Affliliates "Successful Chapter" poster, 2) AGFD technical research poster, & 3) escorting 2 chemistry majors presenting poster on their NSF-REU OSU Chemistry summer 2009 internships

Spring 2008, New Orleans, LA: 3 student research posters in CHED session

Spring 2007, Atlanta, GA: 1 student research poster in CHED session,

1 student/PI research poster in AGFD session
Spring 2006, San Diego, CA: 1 invited research talk in AGFD session
Spring 2004, Long Beach, CA: 1 PI research poster in AGFD session

OK-INBRE (NIH) Summer Research Intern posters mentored and co-authored with student presenters at annual July closing poster session (printed abstract proceedings):

July 2021, OK-INBRE 2021 Summer Research Intern poster session:

1) **EXPLORATION OF NUTRITIONAL COMPONENTS OF REDBUD SEEDS, Cooper McKinney**, Mackenzie Powell, Asuncion Eleazar Rubio, Sergio A. Vazquez Gomez and Dr. Nancy Paiva.

2) **ANALYSIS OF ANTI-NUTRITIONAL FACTORS OF CERCIS CANADENSIS USING MANDUCA SEXTA, Mackenzie Powell,** Skylar Fletcher, Cooper McKinney, Asuncion Eleazar Rubio, Dr. Nancy Paiva.

Both students competed and received favorable comments from poster judges.

July 2017, OK-INBRE 2017 Summer Research Intern poster session:
Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.
(also presented at Spring 2017 national American Chemical Society meeting, CHED Undergraduate Research posters (Biotechnology), San Francisco, CA, April 2017, and AISES meeting September 2017.

July 2015, OK-INBRE 2015 Summer Research Intern poster session:
E. coli expression of a *Medicago truncatula* cDNA-encoded anthocyanin reductase (ANR), **Ludmila Chander** and Nancy L. Paiva.

July 2014, OK-INBRE 2014 Summer Research Intern poster session:
Characterization of DMID, an isoflavonoid pathway enzyme, via interactions with VR, **Tyler Shannon**, Abe Blackburn, James Sharp, and Nancy L. Paiva.
(also presented by T.Shannon at the "OKAMP"/LSAMP poster session at OSU-Stillwater in September 2014)

July 2013, OK-INBRE 2015 Summer Research Intern poster session:
Characterization of DMID, an isoflavonoid pathway enzyme, via interactions with VR, **Santosh Khadka**, Abe Blackburn, Cord Carter, and Nancy L. Paiva.

American Indian Science and Engineering Society (AISES) Research Intern posters mentored and co-authored with student presenters annual National meeting poster session:

AISES October 9-13, 2019, Milwaukee, WI:

1) Cercis Canadensis (redbud) Seed Nutritional Components, Lexus Thomas, Kala Mignone, Asuncion Eleazar Rubio, Sergio A. Vazquez Gomez, and Nancy L. Paiva

2) Escorted 1 undergraduate non-coauthor (Skylar Fletcher) presenting summer poster from NSF-REU in Greece.

AISES October 4-5, 2018, Oklahoma City, OK:

No SE students presented research posters, but I escorted 3 AISES student members to attend the career and internship fair and attend research lectures.

AISES September 22, 2017, Denver, CO:

1) Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), **Payton Whitehead**, E. Landers, L. Chandler, and N.L. Paiva.

2) Comparison of Growth and Energy Content of Spriodela polyrhiza and Lemna minor, Two Potential Biofuel Sources. **Ryan M. Robinson**, P. Sharp, D.S. McKim, and N.L. Paiva.

3) Also escorted 1 undergraduate non-coauthor (Casey Love) presenting summer poster.

AISES November 9-12, 2016 Minneapolis, Minnesota:

1) Escorted 1 undergraduate non-coauthor (Katy Gaskill) presenting summer poster.

2) Also escorted undergraduate officers of the SE AISES chapter (Payton Whitehead, Shane Goff, Katy Gaskill) and 2 other members (Skylar Fletcher & Austin Nichols) to attend career enhancement, chapter-strengthening and regional student sessions.

AISES November 14, 2014, Orlando, Florida:

1) James Sharp, Dr. Nancy L. Paiva, Construction and expression of ANR plasmid for *E. coli*, Research Focus: Biochemistry. Southeastern Oklahoma State University.

2) Aleina M. Pate, James D. Sharp, Dr. Nancy L. Paiva, A Study of Microbes from Durant, Oklahoma, Research Focus: Biochemical Technology. Southeastern Oklahoma State University.

3) Sarrysa A. Eaves[1], A. Bastian[2], L.C. Bailey-Downs, PhD[2], M.A. Ihnat, PhD[2]. Structural Activity of AG311 and Its Efficacy on Resistant Lung Cancer Cells. Research Focus: Drug Development. [1]Southeastern Oklahoma State University. [2]Department of Pharmaceutical Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center. (Note: The research was mentored at OU-HSC, but I mentored Sarrysa through reformatting the poster for the AISES presentation and oral competition; she won $450 for 4th Place among all undergraduate posters.)

Oklahoma Research Day (annual state-sponsored research display): Multiple posters presented in **2010**, **2009, 2008, 2007 & 2006.** I stopped attending this when it moved from fall to spring, due to scheduling conflicts with ACS meetings and other spring events.

Oklahoma Research Day at the Capitol, OKC: Undergraduate researchers from my lab were selected to represent the Southeastern campus at this statewide event, and I was their mentor to guide them through preparing their presentations and the actual event. I mentor them through the reformatting of their work for a more general public audience, discuss strategies for their 3-minute presentations, and help them practice. I go with them to help them set up their displays at 7 AM on the day of the contest, and stay at least until they have presented to the judges. I do not tell tell what to present or how; the final decisions are up to the students:

2008: Tucker Harrison, Jeff B. Hill, Nancy L. Paiva, **"**The Repellent Properties of *Monarda* Species in Oklahoma against *Drosophila Melanogaster*" Tucker Harrison won First Place in the Regional University/Community College competition (and $500) for his poster presentation:

2009: Dale Daniel, Tucker Harrison, Kati Crawford, Michael C. Pilkington & Nancy Paiva, "*Centaurea americana* as a Potential Biodiesel Crop." Dale Daniel won First Place in the Regional University/Community College competition (and $500) for his poster presentation.

2011: Stefan T. Jones presented his poster at the Capitol on March 31, 2011.: Stefan Jones, Allen Baughman, Steve McKim, & Nancy L. Paiva, "Filamentous Freshwater Algae As A Bioenergy Source."

2013: Abraham G. Blackburn presented his poster at the Capitol on April 11, 2013.: Abe G. Blackburn, Ricky Lemons, Nick J. Wade, Diann Baze, Dr. S. McKim, "Duckweed, a Versatile Renewable Resource"

2018: Payton Whitehead presented his poster at the Capitol on March 26-27, 2018.

"Increased Expression and Purification of *Medicago truncatula* cDNA-Encoded Anthocyanin Reductase (ANR), Payton Whitehead, E. Landers, L. Chandler, and N.L. Paiva. Payton Whitehead won First Place in the Regional University/Community College competition (and $500 cash) for his poster presentation.

I have also nominated and coached 4 SE student presenters who carried out their research off-campus, but were selected to represent SE. I mentor them through the reformatting of their work for a more general public audience, help them practice, and go with them to help them set up their displays at 7 AM on the day of the contest, as I do for my own research interns.:

2019: Gabrielle Ford presented her poster at the OKC Capitol on March 25-26, 2019 "Defining the Regulon of Iron-regulated small RNA NrrF in *Neisseria gonorrhoeae* FA1090 with Next Generation Illumina Sequencing", by Gabrielle P. Ford, Southeastern Oklahoma State University, and Dr. Lydgia Jackson and Dr. Dave Dyer, OU-HSC Core Facility, Department of Microbiolgy and Immunology, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma.

2017: Rup Thing presented his poster at the Capitol on March 20-21, 2017 "Bismuth(III) triflate catalyzed esterification-Fries-oxa-Michael route to 4-chromanones", by Rup Thing, Southeastern Oklahoma State University, and Dr. Richard A. Bunce, Oklahoma State University.

2015: Sarrysa Eaves presented her poster at the Capitol on March 31, 2015, entitled "Structural Activity of AG311 and Its Efficacy on Resistant Lung Cancer Cells", by Sarrysa Eaves, Anja Bastian, Lora C. Bailey-Downs, Michael A. Ihnat (OU-HSC Pharmacy).

2014: Kent Davidson presented his poster at the Capitol on April 1, 2014, and won Third Place in the Regional University/Community College competition (and $250) for his poster presentation: "Role For The Tumor Suppressor Protein P27kip1 In Cancer Cell Metabolism" by Kent Davidson (SE), Abdulah Mahayni, Robert J.Sheaff (U. Tulsa).

"OKAMP" (Oklahoma-Louis Stokes Alliance for Minority Participation):

Fall 2021: Mentored 2 LSAMP Scholars, Asuncion Eleazar Rubio and Sergio A. Vazquez Gomez, who will co-present a joint poster at the annual LSAMP meeting at OSU-Stillwater, Oct. 9, 2021: **EXPLORATION OF NUTRITIONAL AND ANTI-NUTRITIONAL COMPONENTS OF REDBUD SEEDS, Author(s): Asuncion Eleazar Rubio*, Sergio A. Vazquez Gomez*,** Cooper McKinney, Mackenzie Powell, Skylar Fletcher. **(*co-presenters)**

2005, 2009, 2013, 2014: Mentored 3 minority researchers (Ricardo Lemus, Cord Carter and Tyler Shannon) in the preparation of their OKAMP poster presentations at the annual Fall OKAMP OSU meeting.

Spring 2007 (Ricardo Lemus in Atlanta, GA) **& 2014** (Cord Carter in Dallas, TX**):** Participated in the NSF-LSAMP workshop to enhance participation in LSAMP activities, and mentored a OKAMP poster presentor during the special NSF-LSAMP-sponsored poster session.

Fall 2014 to Spring 2018: Mentored minority scholar Payton Whitehead as academic advisor and OKAMP research mentor.

Additional presentations were made at university (SE Brain Storm 2011 and 2012), regional, state and local American Chemical Society meetings.

GRANT PROPOSAL SUBMISSIONS AND SUCCESSFUL RESEARCH FUNDING:

I have written and submitted numerous grant proposals, to federal, private and campus funding sources. Below is a listing of the funded grants on which I haved served as PI, with a very brief description of each.

External Grants awarded since Fall 2002:

1) RR03010 (Waxman, state proposal coordinator) 6/30/2004 – 12/30/2006
NIH/INBRE (IDeA Networks of Biomedical Research Excellence)
For 2.5 year: $199,000 total in direct costs, plus approximately $38,000 in indirect costs.
PROJECT TITLE: Oklahoma IDeA Networks of Biomedical Research Excellence
SUBPROJECT TITLE: Biosynthesis of Isoflavonoid and Flavonoid Nutrients

The major goals of this project are to use functional genomics techniques to identify clones encoding biosynthetic enzymes essential to accumulation of nutritionally beneficial natural products in plant-based foods, and to help a new faculty member establish research contacts within the Oklahoma BRIN-INBRE network.

2) NSF 0421379 (Paiva) NSF Division of Biological Infrastructure 09/01/04-08/30/06
Program Name: Major Research Instrumentation (MRI) $67,462 (equipment only)
PROJECT TITLE: Acquisition of Protein Purification Instrumentation for Isoflavonoid Research

The major goals of this project are to acquire a protein chromatography system and associated protein purification and analysis equipment to be used in undergraduate education and research activities, and to use this instrumentation to biochemically characterize and purify enzymes related to natural product biosynthesis.

3) S06 GM08003 (Paiva) 09/15/04–07/31/09
NIGMS SCORE Individual Research Project
Approx. $500,000 for 4 years including indirect costs, plus 1 year no cost extension)
SUBPROJECT TITLE: Analysis of Beta-Glucosidases Active on Isoflavonoid Conjugates

The major goals of this project are to analyze the biochemical and molecular properties of plant beta-glucosidases (BG1 and BG2) with high specificity towards isoflavonoid conjugates, potentially important constituent of foods ("nutraceuticals").

4 & 5) NSF/EPSCoR Program Grant # EPS-0132534 (Waxman, state proposal coordinator)
06/07/04 – 05/31/05: $20,499; One-year sub-award by Oklahoma NSF-EPSCoR Summer Outreach Program, from the final year of the state proposal.
05/15/05 -4/30/08: $19,500 per year for 3 years; 3-year award from a new Oklahoma NSF-EPSCoR Summer Outreach Program, from a new state proposal.
SUBPROJECT TITLE: SOSU NSF-EPSCOR-Educational Outreach Efforts-Summer Science Workshop: "Summer Workshop on the Analysis of Medicinal and Edible Plants of Southeastern Oklahoma" The goals are to introduce college students during the summer months to research methods and reinforce science, math and computer skills required for research careers, to increase the number of students entering graduate programs or research careers in Oklahoma. The summer program provides for classroom instruction, basic laboratory skills, and development of a research project, and tours of graduate science programs and research opportunities in Oklahoma and N. Texas.

N. Paiva administers the funds, recruits students, and organizes the summer activites, but some students may carry out research in various research labs at SOSU.

6) NGT5-40111 (Prime Award) (V.Duca-Snowden, state coordinator) 10/31/02-05/31/05
$7,000/year for 3 yrs initially; NASA OSGC Subcontract No. 2003-29 from NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

Renewed in 2005 for another 2 years, and later extended to August 2010, with NASA OSGC Subcontract No. 2006-23 currently providing $16,000 in undergraduate awards for the 2009-2010 year, matched by $16,000 in state tuition waivers.

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: Undergraduate Fellowships" (SOSU Fellowship administrator: N. Paiva)

These funds, combined with matching funds from SOSU, currently provides $32,000 annually in tuition waivers and other funds for qualifying students to pursue education and training in areas relevant to NASA's programs. Over 100 awards have been made to date.

7) NGT5-40111 (Prime Award)(V. Duca-Snowden, state coordinator) 03/01/04-present
NASA OSGC Subcontract No. 2004-34 $7,500
Renewed in 2005 for an additional **$6,087**
NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: **Workforce Development**" (SOSU grant administrator: N. Paiva; Activities Director: Mr. Scott Hensley, Director, SOSU Career Services and Placement Services)

The goal is to enhance the awareness of students to potential careers and job opportunities relevant to NASA's programs and the aerospace industry. Funds supplement career fair activities, provide travel for the career services staff to relevant meetings and employers, and internships or travel opportunities for students.

The continued funding for NASA workforce development activities are now merged with the NASA OSGC Fellowship awards described in #6 above.

8) NGT5-40111 (Prime Award)(Snowden, state coordinator) 06/01/04-05/31/06
NASA OSGC Subcontract 2005-10 (PI: N. Paiva) $10,130
NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category: Research Infrastructure": Effects of Microgravity and High Iron Soils on Plant Secondary Metabolites.

The funds provide 1 mo. summer support (completed) and travel to 2 NASA research sites for the PI to explore research topics directly with NASA personnel. Limited supply funds are included to aid the generation of preliminary results on the effect of growth parameters on the phytochemical content of important food plants.

9) NASA OK Space Grant Research Infrastructure Augmentation: 08/15/08-08/14/09: $10,500: NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, Subcontract to Southeastern Oklahoma State University

SUBPROJECT TITLE: "Space Plants"

The funds provide 1 mo. summer support (completed) and travel to NASA KSC research sites for the PI to explore research topics directly with NASA personnel. Limited supply funds are included for the generation of preliminary results on the effects of extended exposure to low Earth orbit conditions on seeds and klinostat growth conditions on plants on the phytochemical content of cinnamon basil plants.

10) Oklahoma Center for the Advancement of Science and Technology (OCAST) R&D Internship Program: Earth Biofuels, Inc. and Southeastern Oklahoma State University
OCAST award #AP071-i19, May 1, 2007 – February 29, 2008; Year 1: $26,736
Project Title: Investigation of Biofuels Production Parameters.
Project role: P.I./Mentor for interns.

Summary: The R & D undergraduate interns worked under the supervision of the plant manager (Jimmy Stephens, project mentor), chemist (Ron Workman, project mentor), and plant operators at the biodiesel plant on projects related to the commercial conversion of vegetable oils to high quality biodiesel (B100). To augment the chemical analysis instrumentation at this new plant and to eliminate possible delays from sending research samples generated at the plant to outside laboratories, SOSU interns used valuable research-grade instrumentation in the SOSU Department of Chemistry, Computer and Physical Sciences, under the supervision of Nancy Paiva (project P.I. and mentor). They also used SOSU computers for preparation of reports, posters and timesheets.

Operated only first year of 2 year award, due to economic difficulties at biofuels partner firm.

11) Oklahoma Center for the Advancement of Science and Technology-Applied Plant Science program. OCAST award #PSA08-03, 2 years, $50,000, including match. 05/01/08-04/30/10.
Project Title: Evaluation of *Centaurea americana* as a biodiesel oilseed crop.

The fatty acid profile of Centaurea *americana* (American basket flower) seed oil is very similar to soybean and corn oils, and therefore may serve as an excellent alternative for modern production of biodiesel fuel. This research is investigating the potential for genetic variation or environmental differences having an effect of oil composition, and investigating the possible agronomic yield of the seed and oils. Undergraduate researchers are assisting in data collection, including GC-MS analysis of fatty acids.

12) NASA OK Space Grant Research Infrastructure Augmentation: 08/15/09-08/14/10: $16,000

NASA Oklahoma Space Grant Consortium, Univ. of Oklahoma, Subcontract to Southeastern Oklahoma State University (*Received 1-year no cost extension.*)
SUBPROJECT TITLE: Biofuels from Algae

The funds provide 1 mo. summer support (in 2010) and travel to NASA events. Limited supply funds are included to aid the generation of preliminary results on the production of biofuels from algae, with undergraduate researchers.

13) P20RR016478-09 (Akins, state proposal coordinator) 04/01/2010 – 03/31/2011
NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
For 1 year: **$24,995** total in direct costs.
PROJECT TITLE: Oklahoma IDeA Networks of Biomedical Research Excellence-II,

SUBPROJECT TITLE: Analysis of Phytochemicals in a Traditional Herbal Remedy for BPH

14) P20RR016478-09 (Akins, state proposal coordinator) INBRE-I 11/19/2009-3/31/2010 INBRE-II 4/1/2011-4/30/2014; INBRE-III 5/1/2014-4/30/2019; INBRE-IV 5/1/2019-4/30/2023. NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: Oklahoma INBRE-Institutional Funds (carryforward and other funds)
TOTAL AGREEMENT 2009-2010: $70,000
TOTAL AGREEMENT 2010-2011: $40,000
TOTAL AGREEMENT 2011-2012: $32,000
TOTAL AGREEMENT 2012-2013: $24,575
TOTAL AGREEMENT 2013-2014: $40,000
TOTAL AGREEMENT 2014-2015: $25,000
TOTAL AGREEMENT 2015-2016: $25,000
TOTAL AGREEMENT 2016-2017: $25,000
TOTAL AGREEMENT 2017-2018: $20,000
In 2018-2019, no funding due to end of NIH funding cycle, but pages of reporting and other information were required to support the rewnal application to NIH. Renewed for 2019-2023.
PROJECT DIRECTOR at SE: Dr. Nancy L. Paiva (SEOSU INBRE institutional representative)

The funds are used by SOSU to purchase equipment and research supplies to support biomedical research and research training efforts in multiple departments on campus. My role is to collect equipment requests from SE faculty doing biomedical research or research-training, adapt those to the provided budget and NIH format, submit for approval by the state and federal NIH offices, submit all SE grant paperwork for approval, and make all purchases to ensure billing and delivery by the OK-INBRE and NIH funding deadlines.

15) Oklahoma National Science Foundation EPSCoR (OK NSF-EPSCoR) Small Grants Program (via subcontract from Oklahoma State University): 08/1/10-08/31/11: **$24,984**
SUBPROJECT TITLE: Evaluation of filamentous freshwater algae as a bioenergy source.
PI: N.L.Paiva Co-PI: S. McKim

16) NSF ARRA-ARI: Renovation of Biotechnology and Chemistry Research Laboratories at SEOSU. **PI: Nancy L. Paiva** Co-PIs: Joel T. Smith . Other Senior Personnel: Eddie Harbin and Jerry Polson. Submitted 08/24/09; Amount requested: $485,000.
Awarded **$475,458** from NSF on 9/10/10. Additional funding from SOSU to enhance the project provided LED lighting, to reduce energy consumption. Award was effective September 15, 2010 and expired August 31, 2013. This award was funded under the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law 111-5).

17) American Chemical Society Innovative Activities Grant (IAG) 2010-2012 to the Southeastern Oklahoma State University American Chemical Society (ACS) Student Members Chapter, from the ACS Undergraduate Programs national office
Role: PI/Advisor/author.
Proposal Title: Helping Rural Students Prepare for College Science Majors, $500 (plus $500 in match funds). Rebekah Ritchie, ACS-Student Chapter President, & Dr. Nancy L. Paiva, Chapter Co-Advisor, Southeastern Oklahoma State University (SEOSU), Durant, OK.

18) NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract No. 2006-23, (Prime Award NGT5-40111) (V. Duca-Snowden, state coordinator)
08/15/09-08/14/2011 award total (Modifications 5,6, & 7): $39,500
08/15/06-08/14/2011 (including 1-year no-cost extension to contract) 6-year total: $131,167.17
SUBPROJECT TITLE: "Oklahoma Space Grant College and Fellowship Program, CMIS Category (including Workforce Development)" (SOSU grant administrator: N. Paiva)

These funds, combined with matching funds from SOSU, currently provides $32,000 annually in tuition waivers and other funds for qualifying students to pursue education and training in areas relevant to NASA's programs. The goal of the Workforce Development is to enhance the awareness of students to potential careers and job opportunities relevant to NASA's programs and the aerospace industry. Funds supplement career fair activities, provide travel for the career services staff to relevant meetings and employers, and internships or travel opportunities for students.

19) NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract No #2012-10 for the project entitled "Oklahoma NASA Space Grant Consortium" under the direction of Dr. Paiva as the SEOSU Project Director. This subcontract is for the project/budget period of **1/01/11 – 10/31/16** and provides Year 1 and Year 2 funding to date in the amount of **$62,405,** and Year 3 funding for **$17,343,** and Year 4 and 5 funding for $10,500 each, with some tuition waiver match from SE**.**

This includes both NASA OSGC fellowship funding as well as funding for a robotics workshop for students and other projects.

20) NASA Oklahoma EPSCoR Travel Grant Fall 2011 (**$2,000**) and Research Infrastructure Grant (**$21,000**). 2/01/12 – 6/30/2012
Subcontract #2012-23 to SOSU from OU Prime award # # NNX07AL49A, CFDA #48.008.
Project Name: NASA EPSCoR Research Infrastructure Development: Biofuels from Aquatic Biomass
PI: N. Paiva; Co-PIs/Collaborators: Dr. Steve McKim (SOSU) and Dr. Raymond Wheeler, NASA KSC Plant Physiologist

Travel funds paid for the PI and Dr. McKim and 2 students to travel to NASA Kennedy Space Center to discuss potential areas of scientific collaboration in Fall 2011. Completion of this phase allowed the PI to successfully compete for additional travel funds for the spring and summer, to carry out relevant experiment on duckweed as a potential biomass crop and agent for water and air purification. A student will present some of these results at OK Research Day at the Capitol 2013.

21) NSF Oklahoma EPSCoR Educational Outreach Grants: Spring 2014 (**$39,679**) and Summer 2014 (**$44,761**). 6/01/13 – 5/31/2015 EPSCoR-2013-25 and amendment #1:Subaward contract to SOSU from OSU-Stillwater Prime award # IIA-1301789, CFDA #47.080.
Project Name: NSF OK EPSCoR Undergraduate Science Workshops for basic research skills and campus tours.
PI: N. Paiva; Collaborators: Cynthia Sanders, College of the Muskogee Nation, Okmulgee, OK.

National Science Foundation funds paid for lab supplies, travel expenses, student stipends, and other costs for 12 SE undergraduates (11 Native Americans) to participate in workshop exercises allowing them to get hands-on research experience. Additional workshop sessions included discussions of how to apply to future research internships in OK, how to analyze data and design experiments, and other aspects of science careers. Students were taken on tours of research campuses, emphasizing labs or researchers involved in recent EPSCoR-funded projects or core labs which would be analyzing their research samples. All students had to assemble their own research data into a scientific poster and present it to the group. Students received cash stipends upon completion of the workshop exercises. All SE student also received 2 credits via the course listing of CHEM4972: Special Studies: Introduction to Research. This grant also generated over $4,000 in Indirect costs paid to Southeastern.

22) OK-INBRE Release Time Award for Spring 2016: "NSF S-STEM scholarships for Southeastern Oklahoma State University science majors". OK-INBRE is providing funds release me from 25% of my Spring 2016 teaching load, to allow me to have more time to prepare and submit a large scholarship proposal on behalf of Southeastern. The funds come from the Oklahoma State Reagents of Higher Education funds which OK-INBRE receives as match for the National institutes of Health. In addition to student scholarships, the proposal will requests funds for activities and course or curriculum modifications to enhance the graduations rates of STEM students from low-income backgrounds.

This award saves the SE budget **over $10,000** this semester, at a time of budget crises.

23) OK-INBRE Travel Grants for Faculty for Spring 2016: NPaiva & LChandler travel to ACS Spring 2016 meeting. OK-INBRE has awarded **$2,000** to partially fund the travel of Dr. Paiva and Lily Chandler for the undergraduate to present her Summer 2015 OK-INBRE Internship results at the American Chemical Society national meeting in San Diego. As mentor, Dr. Paiva will assist her co-author is presenting, and attend curriculum development sessions during the meeting, in addition to both attending technical presentations.

24) On-going: NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract on Prime Award # NNX15AK02H for the project entitled "Oklahoma NASA Space Grant Consortium" under the direction of Dr. Paiva as the SEOSU Project Director. This subcontract is for the project/budget period of **5/01/15 – 04/30/18 plus 4th year extension** and provides Year 1 to Year 3 funding to date in the amount of **$117,250,** including $30,000 in supplemental Summer 2017 funding for special intern and travel projects, with SE in-state tuition waivers as partial match from SE**. The 5th year of continued funding was approved and will end in June 2020, at which time the funding will switch to a very different format, emphasizing undergraduate research more than academic cost defrayment and scholarships.**

25) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2016 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$6,732** Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students

(under 70 hours complete at time of application). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

26) A) Oklahoma NSF EPSCoR Travel grants: Fall 2016 award: **$5,000**. Fall 2017 award: **$8,085**.
PI: NPaiva
Educational Outreach funds were awarded to cover most of the costs of taking 5 students to the Fall 2016 AISES meeting in Minneapolis, MN, and 4 students to the Fall 2017 AISES meeting in Denver, CO, along with 2 faculty advisors (NPaiva and ASpahn). The funds cover airfare, lodging, registration and food while at the meeting. AISES (American Indian Science and Engineering Society) promotes increasing the participation of Native Americans in STEM activities and careers, and the meeting provides many mentoring activities and ways to connect with future internship hosts and graduate programs.

B) Oklahoma NSF EPSCoR Physics Instructor Support grants: Fall 2016 award: **$32,000**. Fall 2017 award: **$32,000**.
Prime Award No.: OIA-1301789 **Subaward No.:** EPSCoR—2016-10
Administrative Contact/Lead Author: NPaiva **Project Director:** Tim Smith
Project title: Full –Time Physics Instructor and Additional STEM Mentor for Native American Undergraduates
During Summer 2016, when SE was entering a severe budget crisis, I was approached by the OK-NSF-EPSCoR office about how a previously-planned outreach project had fallen through at another campus, and I was asked to submit something that would benefit Native American STEM majors at SE. After consultation with newly-appointed Assistant VP Tim Boatmun, we agreed that seeking funding to support Alex Spahn as the Physics Instructor would best serve NA students seeking medical degrees, by helping to protect that position from budget cuts, while helping the overall university funding situation. The proposal I eventaully submitted on behalf of SE covered approximately 50% of all salary and benefits for a full-time physics intructor for 2 years, saving the university thousands of dollars over-all yet still increasing the instructor's pay slightly over the year before. I wrote several drafts of the proposal incorporating feedback on the correct tone and content from the OK EPSCoR office, received the initial contracts from the lead office, then asked Dr. Smith to serve as Project Director as Department Chair of CCPS, so that he could handle all of the department and grant employee transaction paperwork in parallel.

The travel grants described immediately above were also intended to take the partially-funded Physics Instructor to 2 AISES national meeting along with multiple students, to make him more aware of issues concerning Native American STEM majors, as well as opportunities available to them.

27) Oklahoma NSF EPSCoR Research Opportunity Award (ROA) May 1, 2017 to August 15, 2017. Award: **$12,499.52** PI: NPaiva
Project title: Genome Sequencing of Microbes Isolated from Oklahoma Soils-ROA.
Pass through entity: Oklahoma State University, PTE Federal Award #: OIA-1301789
Funds provided for the purchase of next-generation DNA sequencing reagents, travel between Durant and Stillwater for training and consultation with scientific mentor at OSU, development of teaching resources for Biochemistry and Molecular Genetics laboratory classes.

28) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer Intern 2018 Funds-hosting Payton Whitehead. Oklahoma-INBRE provided **$2,200** in research supplies to off-set some of the costs associated with hosting a summer undergraduate research intern, and preparing his research poster for presentation at the mandatory session in OKC, and **$5,000** in summer intern wages.

29) Oklahoma Center for the Advancement of Science and Technology (OCAST) R&D Interns Project #: IP17-021 for 2 years (1/1/2017 to 12/31/2018) with company partner ETS-Lindgren, Inc., Durant, OK.
PROJECT TITLE: Research to Improve the Reproducibility and Performance of EM-Absorbing Foam Products at ETS Lindgren, Durant, OK.
Award: OCAST**:$10,230**/yr, Match from ETS and NASA OK Space Grant: **$11,230**/yr
Funding supports 1-2 SE undergraduates as R&D interns helping to develop EM-blocking foam products by 2 methods and improve or adapt new manufacturing systems.

30) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2018 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$5,995**
Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students (under 70 hours complete at time of application; Dyani Shores and Auston Patton). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

31) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2019 SMaRT Program Interns (Summer Mentoring and Research Training) Award: **$5,972**
Funds provided for part-time support of 2 interns and partial summer support for PI, and $1,000 in research supplies, to host 2 Sophomore students (under 70 hours complete at time of application; Sergio Vazquez Gomez and Lexus Thomas). Program is designed to address need to encourage lower-level students not yet ready for regular upper-level INBRE internships.

32) Oklahoma NSF EPSCoR Travel grants: Fall 2019 award: **$3,000**. PI: NPaiva
Educational Outreach funds were awarded to cover most of the costs of taking 2 students to the Fall 2019 AISES meeting in Milwaukee, WI. The funds cover airfare, lodging, registration and food. AISES (American Indian Science and Engineering Society) promotes increasing the participation of Native Americans in STEM activities and careers, and the meeting provides many mentoring activities and ways to connect with future internship hosts and graduate programs. Both students were required to be Native American, AISES members, and presented judged research posters.

33) On-going: NASA Oklahoma Space Grant Consortium, University of Oklahoma, to Southeastern Oklahoma State University; NASA OSGC Subcontract from new lead office at OSU-Stillwater, with requirement for mission-oriented research major component. **New award**

approved for NASA funds totalling $30,000/yr for 4 years, from July 2020 to June 2024, plus match from SEOSU.

34) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education Award: **$25,728** (including Indirect Costs)**, May 1, 2020 to April 30, 2021.**
PTE Federal Award No: 5P20GM103447-21 Subaward No: RS20181585-36
PROJECT TITLE: Oklahoma IDeA Network of Biomedical Research Excellence: OK-INBRE Supplemental Research Funding Requests
SubAward PI for funding to support undergraduate research experiences for SE students during the coming 2020-2021 grant year, to use up funds that were carried over due to cancellation of Summer 2020 internship opportunities. Our plan is to give priority to 2 students who had either applied and been accepted to the regular upper-level INBRE 2020 Summer Internships (now cancelled), and others who were named in a SMaRT **(Summer Mentoring and Research Training)** proposal for lower-level students that was in the process of being submitted when our campus was closed in mid-March 2020. If those original students are not available sufficiently to work enough hours to use up their allotted funds during the coming year, we do have additional alternate students who were accepted to out-of-state internship programs that were cancelled, and/or who could also benefit from additional research experience before graduation.

35) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: Oklahoma IDeA Network of Biomedical Research Excellence-OK-INBRE Equipment Requests, Fall 2020 to April 30, 2021
Award: **$50,000**

As SE campus OK-INBRE representative, I coordinated assembling the SE request for equipment to support reseach and research training on our campus. A total of $50,000 was offered to SE, with a short response deadline. I requested input from CCPS and Biological Sciences, worked with faculty to cut requests that were redundant with equipment already available on campus (which I had purchased as INBRE rep in prior years). I also secured accurate quotes including required accessories, shipping and handling, plus edited faculty justifications for these requests. After SE approval, I sent all documents to the OK-INBRE office to be included in the state request to NIH in D.C. Final purchases were all made before April 30 deadline.

35) NIH/INBRE (IDeA Networks of Biomedical Research Excellence, NIH National Center for Research Resources) and OK State Regents for Higher Education
PROJECT TITLE: OK-INBRE Summer 2021 Interns, May 1 to August 15, 2021
Award: **$4,400**

Internal SOSU Campus Research grants awarded since Fall 2002:
1) Title III Center for Instructional Development &Technology (CIDT) 07/01/03 - 06/30/04 (Via award to Southeastern Oklahoma State University) Total awarded: $9,001
Composite Project/Proposal Title for 4 separate CIDT proposals for 5 items: Acquisition of computers, software, and digital projectors for chemistry instruction:

a) Requested a high-end personal computer and color printer for use in laboratory research and biotechnology instruction and digital imaging. This computer has been heavily used, to photodocument gels and other research specimens, and to draft research presentations.
b) Requested a ceiling-mounted digital projector for S217, facilitating PowerPoint presentations for course lectures and student research presentations. This projector has been heavily used, by both myself and other faculty.
c) Requested a document camera (ELMO) d) Requested a student response system (Educue).

2) I was awarded $800 from the SEOSU Organized Research Fund to help cover my travel costs to an American Chemical Society spring national meeting in Long Beach, CA, in 2004. I was also awarded $7,000 to purchase a refrigerated microbial incubator and a freezer in 2002, to initiate my campus research.

3) I was awarded $1050 from the SEOSU Organized Research Fund to help cover my travel costs to an American Chemical Society spring national meeting in San Diego, CA, in 2012.

4) I was awarded $3,808 from the SEOSU Organized Research Fund to help cover my travel and research supply costs for a duckweed biofuels research project in collaboration with the OSU Bioenergy Center during Summer 2013.

5) I was awarded $1,644 for Fall 2018-Spring 2019 from the SEOSU Organized Research Fund to cover the generation of custom polyclonal antisera raised against the ANR antigen generated by recent OK-INBRE SMART and regular summer interns.

PROFESSIONAL SERVICE: (outside Southeastern)

Refereeing and Reviewing:

USDA Small Business Innovation Research (SBIR) Grants Program, ad hoc grant reviewer, for the Biofuels and Biobased Products topic area, 2018-2019.

USDA Small Business Innovation Research Grants Program, grant review panel member, 2001, 2004 & 2009.

Oklahoma Space Grant Consortium NASA-EPSCoR Research Initiation Grants and Travel Awards review panel member, 2006-present.

Center for Dietary Supplement Research: Botanicals, UCLA Center for Human Nutrition, review panel member, 2000 to 2005.

USDA National Research Initiative Competitive Grants Program, grant review panel member, 1997, 1998, and 2000.

Peer-reviewed grant proposals for USDA, BARD and NSF.

Reviewed manuscripts for journals including Journal of Agriculture and Food Chemistry, Plant Molecular Biology, Plant Cell, Plant Physiology, Phytochemistry, Proceedings of the National Academy of Science, Nature, Plant Pathology, Phytopathology, and Molecular Plant-Microbe Interactions.

Enzyme and Microbial Technology, international advisory board member, 1999-2002.

State Committee Service:

2005 Summer Statewide Grant Writing Workshop mentor (Linda Mason, coordinator)

2012-2014 OK NSF EPSCoR Broader Impact Committee member (Dr. James Wicksted, chair)

Professional Society Service:
American Chemical Society faculty adviser reviewer of external Student Member Chapter reports, **2013 to present**.
American Chemical Society **"Chemistry Ambassador"** (a volunteer program coordinated by the national office), **2013 to present**, working to help improve public appreciation of chemistry.
Guest lecturer: Lectured at University of California at Los Angeles (UCLA) in Spring 2007, Fall 2008, Fall 2009, Fall 2012 and Fall 2013 to support a course on plant-microbe interactions. Title of lecture: "An Introduction to the Biosynthesis of Chemicals Used in Plant-Microbe Communication."

Special Assignments or Service projects at Southeastern:

Annual March SE Curriculum Contest, Author and Administer Chemistry Exam, 2007 to 2013, 2018: Write or revised a 50-question multiple choice chemistry exam consistent with OK state curriculum guidelines, and organize the testing of up to 120 high-school competitors in 3 classrooms, followed by grading, score reporting and declaration of the winners. After several consecutive years of service, I had handed off the assignment to a new faculty member who recently left SE, so I was asked to take the duty back again.

Science Olympiad at Southeastern:

2016: Organized and scored the **Food Science** (emphasizing dairy science) paper exam and lab activities event for middle-schoolers, plus recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2017: Organized and scored the **Food Science** (emphasizing calorimetry of dry foods and sugar analysis) paper exam and lab activities event for middle-schoolers, and **Experimental Design** simple experiment challenge and extensive write-up form for middle-school and high school students. Recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2018: Organized and scored 4 events, with help of 1 faculty and multiple students. **Crime Busters (B):** Middle-school versions of forensics competition, where students are given a written scenario of a crime, chemical or physical evidence collected at the scene plus reagents and standards, and are asked to examine the evidence and propose which suspect committed the crime. **Chemistry Lab (C):** High-school event emphasizing chemical thermodynamics and other designated experiments, plus a written exam involving calculation from data provided. **Fermi Questions (C):** High-school event emphasizing order-of-magnitude approximation of numerical answers to a wide variety of questions. (Most of the questions and answer key were written by Dr. McKim, who could not be present to administer or score exam.) **Fast Facts (B):** Middle-school paper-based competition where pairs of students attempt to fill in as many correct answers on a grid answer sheet with categories on 1 axis and first letter of the answer on the 2nd axis. 3 5-minute rounds are scored. Recruited and organized student volunteers (mainly from ACS student members). Provided additional food and T-shirts for volunteers.

2019: Organized and scored 2 events (**Fermi Questions (C) & Density Lab (B),** a new event), with help of 1 faculty member and students. Helped ACS students sell refreshments.

STEM Day recruiting event at SE, Saturday, December 1, 2018. Presented 2 30-minute talks about the Chemistry Department and the 3 non-medical degree tracks available to high-school students, as part of a new half-day SE recruiting event for STEM majors.

SE Summer Orientation Events. 2016, 2017, 2018. At the request of the SE office of Student Life and other organizers, I have served as a "Faculty Friend", speaking to multiple groups of incoming students about designated topics from a faculty perspective, and answering questions. I try to reassure them that faculty want students to succeed, and give some advice on things to do or avoid.

Professional Courses Attended:

Space Exploration Plant and Plant Microbiome Learning Sessions, weekly October 1, 2020 to October 29, 2020, free on-line on Zoom conference of over 200 participants. Conference featured NASA and outside researchers explaing the past 30 years of plant research carried out in space and on land, reviewed current equipment available or soon to be available, and related NASA mission information. NASA ia trying to educate a community to help plan future research and mission priorities. This was very useful to plan future NASA OSGC Space Grant research steps at SEOSU. I also attended the follow-up town hall planning session online.

Mass Spec Summer School 2019, University of Wisconsin, Madison, WI, July 21-23, 2019. Hosted by Dr. Joshua J. Coon, Director, NIH National Center for Quantitative Biology of Complex Systems. Funded by NIH and a special award from NSF to fund registrations of 20 plant researchers interested in using mass spec in plant metabolomics and proteomics. I applied to gain more updated information for my research and Biochemistry teaching, and to learn how instrumentation has evolved to change experimental design requirements. Some presentations were excellent and relevant, while some were examples of how not to teach students.

NSF-EPSCoR Native STEM Summit, in Montana Kalispell MT Meeting Sept. 27-29, 2018. The meeting was sponsored by the MT-NSF-EPSCoR office, but I was requested to accompany the Oklahoma NSF-EPSCoR delegation, based on my involvment in many aspects over the past 15 years. Goals included discussion of Native American STEM education issues in an organized forum with an eye to writing future grant proposals, with or without collaborations with tribal organizations or other state partners outside of Oklahoma. The discussions identified many obstacles facing Native American students, made lists of programs that had been implemented in other states in the past, and possible future directions. The Oklahoma EPSCoR office may be collaborating on an NSF INCLUDES multi-state application, but some of the information discussed is very relevant to much smaller proposals from other agencies.

"**ASMCUE 2018 Pre-Conference Workshop: "Design and Implementation of Your Own CURE in Synthetic Biology**" and **American Society for Microbiology Conference for Undergraduate Educators** (**ASMCUE**), Austin, TX, July 26-29, 2018.

The pre-conference workshop mainly dealt with introducing the principle behind the "Bio Bricks" cloning system, which greatly simplifies assembling a series of contructs by mixing and matching coding regions, promoters, enhancers and terminators in various plasmids using either pre-made units ("BioBricks") or user-generated custom fragments. One huge recent advancement to make the system more accessible and useful for educators is that a collection containing over 3000 parts is available for distribution via the iGEM organization for a fee of $500. iGEM also maintains an on-line registry of the parts in the annual kit, plus others are available by request. A few additional reagents are needed to impliment the system, but I thought the system would be a great to use for large portions of Molecular Genetics (CHEM/BIOL 4124) the next time is is offered, or to use for Biochemistry lab or even my

research (and therefor CHEM 4990). iGem also sponsors national competitions of teams of undergraduates using the technology to design and answer real research questions; viewing these examples on-line or assembling our own team would be educational for students and in line with OK-INBRE and NASA OK Space Grant research training goals.

I also attended most of the main ASMCUE meeting. This was the first time I have ever attended a meeting designed mostly for educators, with no students attending, but I thought it might be a good way to pick up techniques or ideas to improve my teaching or help me handle problems that I have with some students. The plenary speakers and some of the larger sessions were very interesting and useful. However, some of the mini-sessions had appealing titles and abstracts but had little or no useful content, or used vast resources (like squads of graduate student TAs) that are not available at SE. I met many experienced faculty members at all levels who were attending ASMCUE for the first time.

"Chemical Engineering for Chemists", American Chemical Society Short Course (professional education), Chicago, IL, June 20-22, 2017. Reviewed basics of chemical engineering calculations, but also learned about new computer resources and terms or techniques, which could be integrated into a future offering of the departmental course listed in the SE catalog on this topic.

OSU Bioinformatics workshop, Oklahoma State University, Stillwater, OK, campus, August 3-7, **2015**. (participated, and escorted 1 undergraduate participant).
https://pods.iplantcollaborative.org/wiki/display/Events/2015+OSU+Workshop

Mitochondrial Biochemistry, Genetics, and Molecular Biology Workshop, an NSF-Sponsored cCWCS workshop (Chemistry Collaborations, Workshops and Communities of Scholars; www.ccwcs.org), at University of Puerto Rico Medical Sciences Campus in San Juan, PR, July 5-10, **2015**.

"**From Computational Biophysics to Systems Biology**" (CBSB2015) international conference, hosted by Dr. Hansmann, SAMIS Education Center, Oklahoma City, OK (OUHSC hospital/campus), http://www.hansmann-lab.com/cbsb15, May 17-19, **2015**.

Educators' Leadership Academy (ELA) **2014** Symposium: "Remaining True to Your Educator-Self in the 21st Century: Embracing Deep, Intentional, Integrative Learning Workshop", UCO-Edmond, OK, May 15, 2014.

Computational Chemistry for Educators, OSU-Stillwater, OK, July 2011, and SC11, Seattle, WA, November **2011**.

Agilent GC-MS Enviroquant software training, Agilent Training Center (Alpharetta, GA, 2009)
Microarray Techniques Workshop, Oklahoma State University (Stillwater, OK, 2005)
Basic Web Page Design, Southern Oklahoma Technology Center (Ardmore, OK, 2001)
Introductory Molecular Modeling training course (Molecular Simulations Inc./Biosym, Naperville, Illinois. 1996)
Practical Capillary Electrophoresis (American Chemical Society Short Course, 1995)
Molecular Modeling: Methods and Techniques (American Chemical Society Short Course, 1994)