

Biological Sciences Self-Study
Prepared spring 2013 as part of the Arkansas Higher Education Coordinating
Board (AHECB) Mandated Academic Program Review

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Academic Program Review

Introduction

Arkansas State University-Jonesboro (ASUJ) is a four year, public institution with a Fall 2012 enrollment of 13,877 students (10,168 undergraduate, 3,709 graduate), and a basic Carnegie classification of Master's, large programs. Additional Carnegie classification is provided in Table 1.

Table 1 Carnegie Foundation Institution Classifications Arkansas State University Jonesboro	
Classification	Category
Undergraduate Instructional Program	Professions plus arts & sciences, some graduate coexistence (Prof+A&S/SGC)
Graduate Instructional Program	Doctoral, professional dominant (Doc/Prof)
Enrollment Profile	High undergraduate (HU)
Undergraduate Profile	Full-time four-year, inclusive (FT4/I)
Size and Setting	Medium four-year, primarily nonresidential (M4/NR)

Over the last ten years the university has maintained a focus of transitioning to a more research-intensive institution, while enhancing its historical mission of dedication to student learning. The ASU biology programs contribute to achieving these goals, and the economic growth the university and state, by providing university level education for 1) STEM and non-STEM degree programs (i.e., service courses), and 2) education/training for biology related careers.

General Education and Service Courses

The ASU general education program mission is to develop “a foundation and motivation for the lifelong pursuit of learning in undergraduate students at Arkansas State University by introducing them to a broad range of essential areas of knowledge that will enable them to think critically and participate ethically in a democratic nation and a global society.” The program includes several goals, including

Using science to accomplish common goals. Students should understand how science is conducted and the criteria for scientific evidence so that they will be able to make informed decisions about the health and well-being of their communities and the natural environment. They should be aware of the ethical and political issues raised by science.

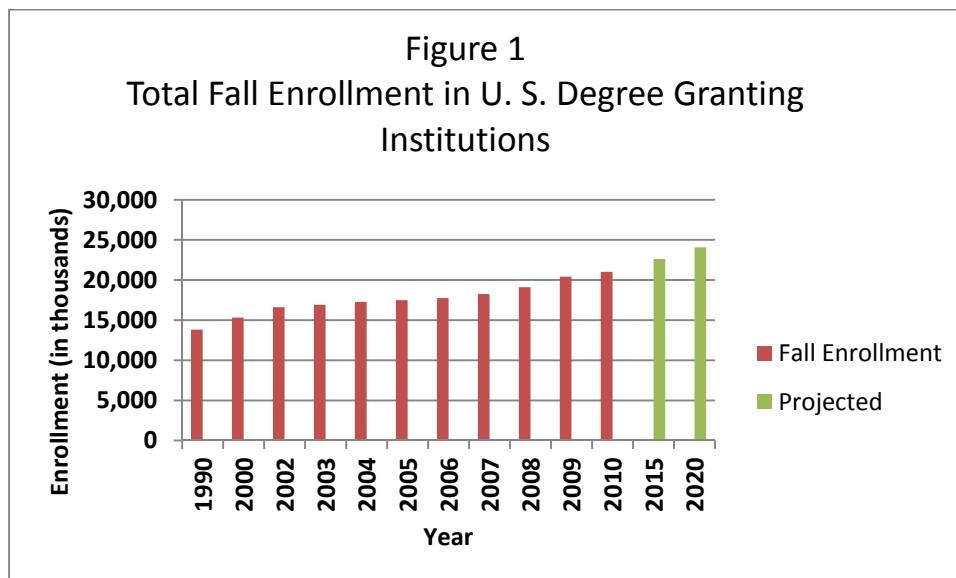
All associate and baccalaureate degree programs offered within Arkansas require the completion of approved general education courses. At ASU this includes completion of two courses; a three credit hour life science lecture and a one credit hour life science laboratory. All general education approved life science courses are offered through the Department of Biological Sciences are identified in Table 2 by the description general education.

Table 2 Biological Sciences General Education and Service Courses					
Course Number	Course Title	Description	Delivery Method(s)	Course Description	Primary Colleges Served
BIOL 1003	Biological Science	general education	traditional online	The major characteristics and processes of life emphasizing the human organism. Promotes understanding of diversity and unity among living organisms with focus on ecological interactions and responsibilities of people within their social and natural environment. Lecture three hours per week. Special course fees may apply. It is recommended that this course be taken concurrently with BIOL 1001. Fall, Spring, Summer.	All
BIOL 1001	Biological Science Laboratory	general education	traditional online	Two hours per week. It is recommended this course be taken concurrently with BIOL 1003. Fall, Spring, Summer.	All
BIOL 1033	Biology of Sex	general education	traditional	Biological basis of sex and reproduction with an emphasis on humans. Course will provide students with a basic functional understanding of human systems, which will lead to informed decisions regarding sexual and reproductive health. Lecture three hours per week. Special course fees may apply. Prerequisite, None. It is recommended this course be taken concurrently with BIOL 1001. Spring.	All
BIOL 1063	People and the Environment	general education	traditional	Major environmental issues facing our society will be covered to equip students to become part of the solution to many environmental challenges confronting us this century. Lecture three hours per week. It is recommended this course be taken concurrently with BIOL 1001. Fall, Spring.	All (required by some Engineering majors)
BIO 2013	Biology of the Cell	general education major requirement	traditional	An introduction to structures and processes in cells, including cellular evolution, biologically important molecules, organelle structure and function, and cellular energy. Lecture three hours per week. Prerequisite, CHEM 1013. Fall, Spring.	Sciences and Mathematics

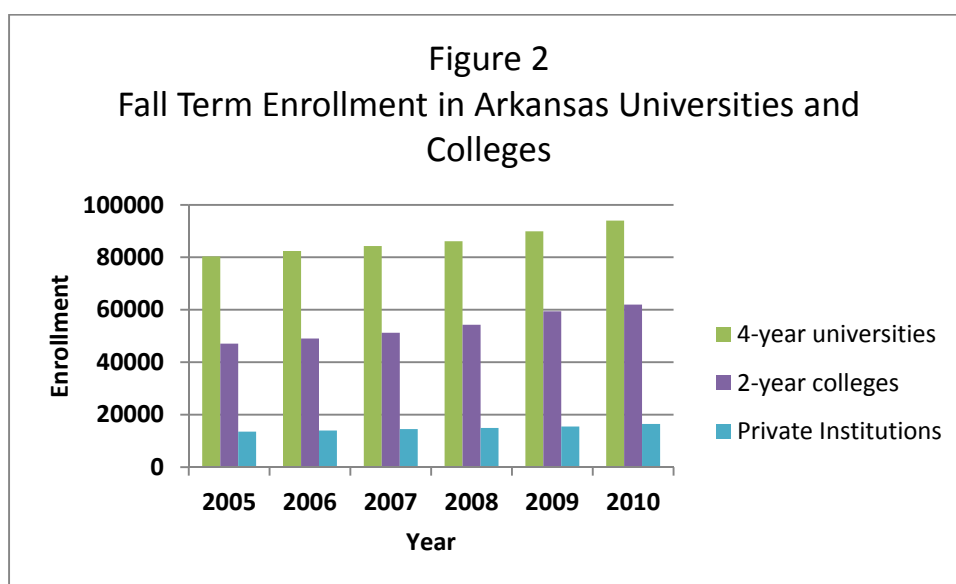
Table 2 Biological Sciences General Education and Service Courses					
Course Number	Course Title	Description	Delivery Method(s)	Course Description	Primary Colleges Served
BIO 2011	Biology of the Cell Laboratory	general education major requirement	traditional	Two hours per week. Recommended to be taken concurrently with BIO 2013. Prerequisite, CHEM 1011	Sciences and Mathematics
BIO 2101	Microbiology for Nursing and Allied Health Laboratory	service	traditional	Two hours per week. It is recommended this course be taken concurrently with BIO 2103. Special course fee, 10.00. Fall, Spring, Summer.	Nursing & Health Professions
BIO 2103	Microbiology for Nursing and Allied Health	service	traditional	Bacteria, viruses, rickettsiae, chlamydiae, molds, yeasts, and protozoans as they relate to human health. Lecture three hours per week. Special course fees may apply. Fall, Spring, Summer.	Nursing & Health Professions
BIO 2201	Human Anatomy and Physiology I Laboratory	service	traditional online	The behavior of matter with respect to life processes, cells, tissues, functional anatomy of integumentary, skeletal, muscular and nervous systems, cat anatomy, nerve and muscle preparations and recordings. Two hours per week. No prerequisites. It is recommended this course be taken concurrently with BIO 2203. Fall, Spring, Summer.	Nursing & Health Professions Education (Health, Physical Education, and Sport Sciences)
BIO 2203	Human Anatomy and Physiology I	service	traditional online	Introduction to atoms, molecules, the biology of organelles and cellular functions, tissues, functional anatomy of integumentary, skeletal, muscular and central nervous systems and interaction with the external environment. Three hours per week. No prerequisites. Fall, Spring, Summer.	Nursing & Health Professions Education (Health, Physical Education, and Sport Sciences)
BIO 2221	Human Anatomy and Physiology II Laboratory	service	traditional online	Major sense organs, autonomic nervous system and internal environment, neuro-endocrine control mechanisms, respiratory and cardiovascular functions, oxygen and carbon dioxide transport, liver functions, digestive, renal and reproductive processes. Two hours per week. Prerequisites, BIO 2201 and BIO 2203. It is recommended this course be taken concurrently with BIO 2223. Fall, Spring, Summer.	Nursing & Health Professions Education (Health, Physical Education, and Sport Sciences)

Table 2 Biological Sciences General Education and Service Courses					
Course Number	Course Title	Description	Delivery Method(s)	Course Description	Primary Colleges Served
BIO 2223	Human Anatomy and Physiology II	service	traditional online	Major sense organs, autonomic nervous system and internal environment, neuro-endocrine control mechanisms, respiratory and cardiovascular functions, oxygen and carbon dioxide transport, liver functions, digestive, renal and reproductive processes. Three hours per week. It is recommended this course be taken concurrently with BIO 2221. Fall, Spring, Summer.	Nursing & Health Professions Education (Health, Physical Education, and Sport Sciences)

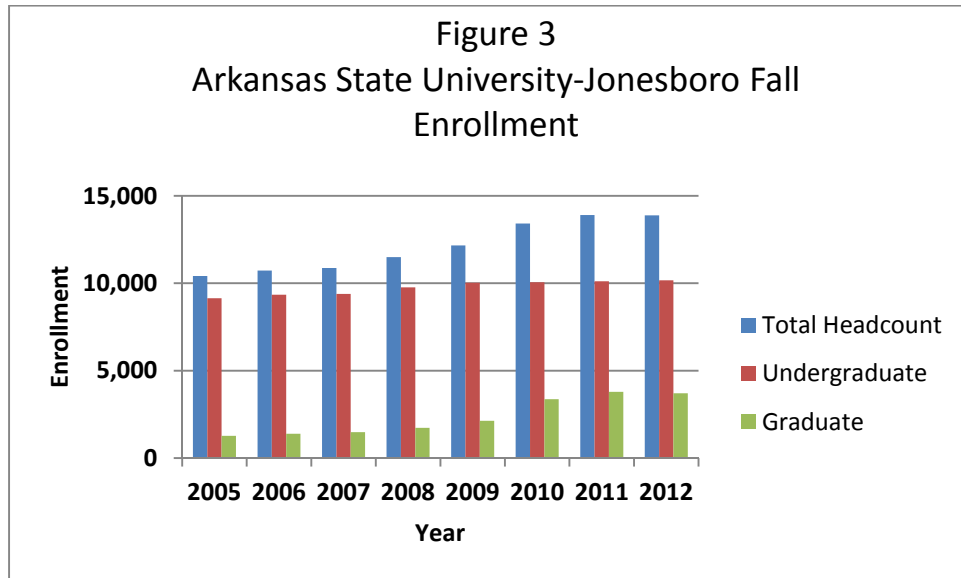
Evidence of the continued demand for general education and service courses can be appreciated by considering the enrollment growth in higher education. Figure 1 shows a 52% growth in total fall enrollment at U.S. degree granting institutions from 1990 to 2010. Moreover, an additional 14.5% enrollment increase is projected between 2010 and 2020.



While Figure 1 includes post-baccalaureate programs, the National Center for Education Statistics (NCES) also indicates undergraduate fall enrollment increased 51.2% between 1990 and 2010 (Fall 1990, 11,959,106; Fall 2010, 18,078,672). As indicated in Figure 2, fall enrollment has increased 17.0 % at Arkansas 4-year universities between 2005 and 2010. Arkansas Department of Higher Education (ADHE) data also indicates total fall enrollment (4-year, 2-year, and private) in Arkansas institutions increased 22.3% during this period (Fall 2005, 140,955; Fall 2010, 172,445), which is similar to the 20.2% enrollment increase indicated by the NCES data for this period (see Figure SC1). Clearly, there is a state level need for Biological Sciences general education and biology service courses.



In-line with the national and state growth trend, ASU Jonesboro fall enrollment has increased 28.8% between Fall 2005 and Fall 2010 (See Figure 3, Fall 2005—10,414; Fall 2010—13,415) with the major contribution to growth coming from graduate students.



Departmental Mission Statement

“It is the mission of the Department of Biological Sciences at Arkansas State University to provide exceptional quality education and research to successfully meet the current and future challenges of Biology.”

Toward fulfilling this mission, the following basic concepts which are pillars of Biology will be incorporated and integrated throughout our curriculum:

1. Evolution, adaptation and diversity (process and outcomes of history of life on earth)
2. Energy flow, genetics and biological machinery
3. Structure and function, and systems

In understanding the connectedness of these concepts, students will learn to apply critical thinking and achieve the following goals:

- a) Obtain a clear understanding of the nature of living organisms as well as biological processes;
- b) Make keen observations to develop hypotheses, devise experiments to test hypotheses, and/or learn how to collect data; analyze and interpret their results;
- c) Learn to work independently as well as a team member, collaborating with peers to fulfill requirements;
- d) Appreciate and participate in the interdisciplinary nature of scientific research, its outcomes and its applications, cultivating a commitment to scientific ethics;
- e) Expand knowledge by searching databases to obtain current information, including primary literature, and build a lifelong desire for learning;
- f) Communicate to share knowledge with peers, faculty, K-12 students and the general public;
- g) Fine-tune intellectual and practical skills to be successful in graduate/professional school and/or a chosen career; and
- h) Foster an appreciation and understanding of the effects of human activities on the natural environment.

Biological Sciences Degree Programs

ASU Jonesboro Department of Biological Sciences offers a BS Biological Sciences (with emphasis areas in Biology, Botany, Environmental Biology, Pre-professional Studies, and Zoology), a Bachelor of Science in Wildlife Ecology and Management, and a Bachelor of Science in Education (BSE Biology). Graduate degrees offered are MS and MA in Biology, a PSM degree in Biotechnology and an MSE in Science Education. The department is also a major contributor to the interdisciplinary Graduate Programs in Environmental Science (EVS: MS and Ph.D.) and Molecular Biosciences (MBS: Ph.D.) Enrollment counts are given in the following table (table 3, Enrollment by Degree Program, fall '03 to '12).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	3-year average	5-year average
Biological Sciences												
BS Biological Sciences	389	377	390	357	349	400	409	423	412	392	409	407
BS Wildlife Ecology & Management	46	37	43	55	42	50	44	48	50	47	48	48
BSE Biology Education	29	18	22	16	10	11	17	18	15	21	18	16
MA Biological Sciences	0	1	1	2	2	3	8	7	3	5	5	5
MS Biology	30	35	26	24	17	23	27	32	30	25	29	27
MSE Biology Education	2	0	1	0	0	2	1	1	0	2	1	1
PSM Biotechnology	--	--	--	--	--	--	--	--	2	3	--	--
Biological Sciences	496	468	483	454	420	489	506	529	512	495	512	506
Environmental Sciences												
MS Environmental Science	--	--	5	11	13	5	3	5	7	13	8	7
PHD Environmental Science	16	22	27	23	25	23	20	19	23	22	21	21
Environmental Sciences	16	22	32	34	38	28	23	24	30	35	30	28
Molecular Biosciences												
PHD Molecular Biosciences	--	--	--	3	11	12	17	19	15	19	18	16
Molecular Biosciences	0	0	0	3	11	12	17	19	15	19	18	16
Total Biological Sciences	512	490	515	491	469	529	546	572	557	549	559	551

Table 3 indicates that total enrollment is near 3 and 5 year averages. However other factors, including increased retention, have resulted in a fluctuation in the number of degrees conferred by the department and its associated programs (table 3), which may be reflective of an increasing trend.

Table 4. Degrees Conferred by Degree Program, Fiscal Years 2002-03 to 2011-12

	2002-	2003-	2004-	2005-	2006-	2007-	2008-	2009-	2010-	2011-	3-year	5-year
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	average	average
Biological Sciences												
BS Biological Sciences	52	54	62	54	45	48	36	44	71	54	56	51
BS Wildlife Ecology & Management	6	6	8	4	6	7	8	3	8	9	7	7
BSE Biology Education	1	11	3	2	6	1	1	1	1	3	2	1
MA Biological Sciences	-	0	4	2	1	0	0	0	3	1	1	1
MS Biology	5	7	7	8	8	5	5	3	10	9	7	6
MSE Biology Education	0	2	2	0	1	1	0	0	1	0	0	0
PSM Biotechnology	--	--	--	--	--	--	--	--	0	6	--	--
Biological Sciences	64	80	86	70	67	62	50	51	94	82	76	68
Environmental Sciences												
MS Environmental Science	--	--	--	4	5	8	6	3	5	3	4	5
PHD Environmental Science	2	4	3	4	2	4	4	1	1	3	2	3
Environmental Sciences	2	4	3	8	7	12	10	4	6	6	5	8
Molecular Biosciences												
PHD Molecular Biosciences	--	--	--	0	0	0	0	0	1	0	0	0
Molecular Biosciences	0	0	0	0	0	0	0	0	1	0	0	0
Total Biological Sciences	66	84	89	78	74	74	60	55	101	88	81	76

Undergraduate degree programs have been redesigned to meet a state mandated maximum of 120 hours for completion. Four-year degree plans for each degree and emphasis area are given in table 4.

Table 5. 4-year plans for undergraduate degrees offered through the department of Biological Sciences.

Bachelor of Science

Major: Biological Sciences – Emphasis in Pre-Professional Studies 2012-2013

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4	x		ENG 1013	Composition II	3	x
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			CHEM 3101	Organic Chemistry I Lab	1	
CHEM 1021	General Chemistry II Lab	1			PHYS 2064	General Physics II	4	
PHYS 2054	General Physics I	4				Social Science	3	x
	Social Science	3	x			Elective	3	
Total Hours		15			Total Hours		17	

Year 3				Year 3			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3		BIO 4104	Microbiology	4	
BIO 3011	Genetics Lab	1		BIO 3233	Human Structure and Function II	3	
BIO 3223	Human Structure and Function I	3		BIO 3231	Human Structure and Function II Lab	1	
BIO 3221	Human Structure and Function I Lab	1		CHEM 4243	Biochemistry	3	
CHEM 3113	Organic Chemistry II	3			Humanities	3	x
CHEM 3111	Organic Chemistry II Lab	1					
	Fine Arts Elective	3	x				
Total Hours		15		Total Hours		14	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
	Upper-Level Biology Elective	3		BIO 4021	Biological Seminar	1	
	Upper-Level Biology Elective	3			Upper-Level Biology Elective	3	
	US History (to or since 1876) or American Government	3	x		Upper-Level Elective	3	
SCOM 1203	Oral Communication	3	x		Upper-Level Elective	3	
	Elective	3			Elective	3	
					Elective	2	
Total Hours		15		Total Hours		15	
Total Jr/Sr Hours				46	Total Degree Hours		
					120		

Bachelor of Science
Major: Biological Sciences – Biology Emphasis
2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4			ENG 1013	Composition II	3	X
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			CHEM 3101	Organic Chemistry I Lab	1	
CHEM 1021	General Chemistry II Lab	1			PHYS 2064	General Physics II	4	
PHYS 2054	General Physics I	4				Social Science	3	X
	Social Science	3	X		STAT 3233	Applied Statistics I	3	
Total Hours		15			Total Hours		17	

Year 3				Year 3			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3		BIO 3033	Evolution	3	
BIO 3011	Genetics Lab	1		BIO 3323	Animal Physiology	3-4	
BIO 3322	Invertebrate Zoology	4		BIO 3321	Animal Physiology Lab		
BIO 3332	Invertebrate Zoology Lab				OR		
	OR			Bio 4513	Plant Physiology		
BIO 3303	General Entomology			BIO 4133	Cell Biology	3-4	
BIO 3301	General Entomology Lab			BIO 4131	Cell Biology Lab		
CHEM 3113	Organic Chemistry II	3			OR		
CHEM 3111	Organic Chemistry II Lab	1		CHEM 4243	Biochemistry		
	Fine Arts	3	X		Humanities	3	X
				SCOM 1203	Oral Communication	3	X
Total Hours		15		Total Hours		15	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3302	Comparative Anatomy	2		BIO 4332	Animal Histology	4	
BIO 3312	Comparative Anatomy Lab	2		BIO 4342	Animal Histology Lab		
BIO 4021	Biological Seminar	1			OR		
BIO 4104	Microbiology	4		BIO 4343	Animal Embryology		
BIO 4542	Mycology	3		BIO 4341	Animal Embryology Lab	3-4	
BIO 4541	Mycology Lab			BIO 4704	Plant Systematics		
	OR				OR		
BIO 4552	Medical Mycology			BIO 4522	Wetland Plant Ecology		
BIO 4551	Medical Mycology Lab			BIO 4531	Wetland Plant Ecology Lab		
	US History (to or since 1876) or American Government	3	X		Electives of Your Choice	6	
Total Hours		15		Total Hours		14	
Total Jr/Sr Hours				Total Degree Hours			
51-53				120			

Major: Biological Sciences – Botany Emphasis 2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4	X		ENG 1013	Composition II	3	X
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			CHEM 3101	Organic Chemistry I Lab	1	
CHEM 1021	General Chemistry II Lab	1			PHYS 2064	General Physics II	4	
PHYS 2054	General Physics I	4				Social Science	3	X
	Social Science	3	X		SCOM 1203	Oral Communication	3	X
Total Hours		15			Total Hours		17	

Year 3				Year 3			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3		BIO 3033	Evolution	3	
BIO 3011	Genetics Lab	1		Bio 4513	Plant Physiology	3	
BIO 3313	Economic Entomology	4			Upper Level Biology Elective	3-4	
BIO 3311	Economic Entomology Lab						
	OR						
BIO 3303	General Entomology						
BIO 3301	General Entomology Lab				Humanities	3	X
CHEM 3113	Organic Chemistry II	3			Elective	3	
CHEM 3111	Organic Chemistry II Lab	1					
	Fine Arts	3	X				
Total Hours		15		Total Hours		15	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 4704	Plant Systematics	4		BIO 4522	Wetland Plant Ecology	2	
BIO 4021	Biological Seminar	1		BIO 4531	Wetland Plant Ecology Lab	1	
BIO 4104	Microbiology	4		CHEM 4243	Biochemistry	3	
BIO 4542	Mycology	3			OR		
BIO 4541	Mycology Lab			STAT 3233	Applied Statistics I		
	OR				Electives	8	
BIO 3542	Plant Pathology						
BIO 3541	Plant Pathology Lab						
	US History (to or since 1876) or American Government	3	X				
Total Hours		15		Total Hours		14	
Total Jr/Sr Hours		46-47		Total Degree Hours		120	

Bachelor of Science
Major: Biological Sciences – Environmental Biology Emphasis
2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4	X		ENG 1013	Composition II	3	X
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			CHEM 3101	Organic Chemistry I Lab	1	
CHEM 1021	General Chemistry II Lab	1			PHYS 2064	General Physics II	4	
PHYS 2054	General Physics I	4			SCOM 1203	Oral Communication	3	X
	Social Science	3	X		STAT 3233	Applied Statistics I	3	
Total Hours		15			Total Hours		17	

Year 3					Year 3			
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Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3		BIO 4133	Cell Biology	3-4	
BIO 3011	Genetics Lab	1		BIO 4131	Cell Biology Lab		
BIO 4704	Plant Systematics	4			OR		
	OR			CHEM 4243	Biochemistry		
BIO 3322	Invertebrate Zoology			PSSC 2813	Soils	3	
BIO 3332	Invertebrate Zoology Lab			PSSC 2811	Soils Laboratory	1	
	OR			POSC 4533	Environmental Law and Administration	3	
BIO 3303	General Entomology				Humanities	3	X
BIO 3301	General Entomology Lab				Elective	3	
CHEM 3113	Organic Chemistry II	3					
CHEM 3111	Organic Chemistry II Lab	1					
	Fine Arts	3	X				
Total Hours		15		Total Hours		16	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 4613	Conservation Biology	3		BIO 4643	Environmental Biology	3	
BIO 4623	Environmental Microbiology	3		BIO 4641	Environmental Biology Lab	1	
BIO 4633	Environmental Toxicology: Mechanisms and Impacts	3		BIO 4021	Biological Seminar	1	
	US History (to or since 1876) or American Government	3	X		Upper Level Elective	3	
	Elective	3			Electives	5	
Total Hours		15		Total Hours		13	
Total Jr/Sr Hours		45-46		Total Degree Hours		120	

Bachelor of Science
Major: Biological Sciences – Zoology Emphasis
2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4	X		ENG 1013	Composition II	3	X
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			CHEM 3101	Organic Chemistry I Lab	1	
CHEM 1021	General Chemistry II Lab	1			PHYS 2064	General Physics II	4	
PHYS 2054	General Physics I	4				Social Science	3	X
	Social Science	3	X		SCOM 1203	Oral Communication	3	X
Total Hours		15			Total Hours		17	

Year 3				Year 3			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3			Zoology Elective	3	
BIO 3011	Genetics Lab	1		BIO 3323	Animal Physiology	3	
BIO 3322	Invertebrate Zoology	4		BIO 3321	Animal Physiology Lab	1	
BIO 3332	Invertebrate Zoology Lab			STAT 3233	Applied Statistics I	3	
	OR				OR		
BIO 3303	General Entomology			CHEM 4243	Biochemistry		
BIO 3301	General Entomology Lab				Humanities	3	
CHEM 3113	Organic Chemistry II	3			Elective	3	X
CHEM 3111	Organic Chemistry II Lab	1					
	Fine Arts	3	X				
Total Hours		15		Total Hours		16	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3302	Comparative Anatomy	2		BIO 4332	Animal Histology	2	
BIO 3312	Comparative Anatomy Lab	2		BIO 4342	Animal Histology Lab	2	
BIO 4021	Biological Seminar	1		BIO 4343	Animal Embryology	3	
BIO 4104	Upper Level Elective	4		BIO 4341	Animal Embryology Lab	1	
	Upper Level Elective	3			Botany Elective	3	
	US History (to or since 1876) or American Government	3	X		Elective	2	
Total Hours		15		Total Hours		13	
Total Jr/Sr Hours				52	Total Degree Hours		
					120		

Bachelor of Science
Major: Wildlife Management and Ecology
2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	X
ENG 1003	Composition I	3	X		CHEM 1011	General Chemistry I Lab	1	X
MATH 1054	Precalculus	4	X		ENG 1013	Composition II	3	X
					MATH 2194	Survey of Calculus	4	
Total Hours		14			Total Hours		15	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		GEOL 1003	Environmental Geology	4	
CHEM 1023	General Chemistry II	3			GEOL 1001	Environmental Geology Lab		
CHEM 1021	General Chemistry II Lab	1				OR		
AGRI 3543	Fundamentals of GIS/GPS	3			PSSC 2813	Soils		
	Social Science	3	X		PSSC 2811	Soils Lab		
SCOM 1203	Oral Communication	3	X			Social Science	3	X
					STAT 3233	Applied Statistics I	3	
						Fine Arts	3	X
Total Hours		17			Total Hours		16	

Year 3				Year 3			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3			Choose two of the following	6	
BIO 3011	Genetics Lab	1		BIO 36X3	Human Dimensions in Wildlife		
	Botany elective	3		BIO 4613	Conservation Biology		
				POSC 4533	Environmental Law and Administration		
				BIO 4312	Fisheries Biology	3-4	
				BIO 4311	Fisheries Biology Lab		
					OR		
BIO 4373	Animal Ecology	3		BIO 4402	Ichthyology		
BIO 4371	Animal Ecology Lab	1		BIO 4401	Ichthyology Lab		
	US History (to or since 1876) or American Government	3	X		OR		
				BIO 4603	Limnology		
				BIO 4601	Limnology Lab		
					Humanities	3	X
					Elective of Your Choice	3	
Total Hours		14		Total Hours		15	
Year 4				Year 4			
Fall Semester				Spring Semester			
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed
	Choose two of the following	7-8		BIO 4021	Biological Seminar	1	
BIO 4352	Mammalogy			BIO 4413	Wildlife Program Internship	3	
BIO 4351	Mammalogy Lab			BIO 4653	Wildlife Management	3	
BIO 4412	Herpetology			BIO 4651	Wildlife Management Lab	1	
BIO 4411	Herpetology Lab			BIO 4704	Plant Systematics	4	
BIO 4423	Ornithology				Elective	3	
BIO 4421	Ornithology Lab						
BIO 4663	Wildlife Management Techniques	3					
BIO 4661	Wildlife Management Techniques Lab	1					

	Elective	3					
Total Hours		14			Total Hours		15
Total Jr/Sr Hours		59		Total Degree Hours		120	

Bachelor of Science in Education
Major: General Science: Biology Emphasis
2011-2012

Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. Mandatory state and institutional assessment exams will be required during your degree program. **Failure to participate in required assessments may delay graduation.**

Year 1					Year 1			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 1013	Biology Making Connections	3			BIO 1503	Biology of Plants	3	
BIO 1303	Biology of Animals	3			BIO 1501	Biology of Plants Lab	1	
BIO 1301	Biology of Animals Lab	1			CHEM 1013	General Chemistry I	3	x
ENG 1003	Composition I	3	x		CHEM 1011	General Chemistry I Lab	1	x
MATH 2194	Survey of Calculus	4	x		ENG 1013	Composition II	3	x
					SCOM 1203	Oral Communication	3	X
Total Hours		14			Total Hours		14	
Year 2					Year 2			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 2013	Biology of the Cell	3	X		BIO 3023	Principles of Ecology	3	
BIO 2011	Biology of the Cell Lab	1	X		CHEM 3103	Organic Chemistry I	3	
CHEM 1023	General Chemistry II	3			PHYS 2064	General Physics II	4	
CHEM 1021	General Chemistry II Lab	1				Social Science	3	X
PHYS 2054	General Physics I	4			SCED 2xx3	Introduction to Secondary Teaching	3	
PSY 2013	Introduction to Psychology	3	x					
Total Hours		15			Total Hours		16	
Year 3					Year 3			
Fall Semester					Spring Semester			
Course No.	Course Name	Hrs	Gen Ed		Course No.	Course Name	Hrs	Gen Ed
BIO 3013	Genetics	3			BIO 3033	Evolution	3	

BIO 3011	Genetics Lab	1			SCED 3515	Performance Based Instructional Design	5	
PSY 3703	Educational Psychology	3			ELSE 3643	The Exceptional Student in the Regular Classroom	3	
GEOL 1003	Environmental Geology	3			PHYS 1103	Introduction to Space Science	3	
HLTH 2513	Principles of Personal Health	3				OR		
	US History (to or since 1876) or American Government	3	x		PHYS 3033	Astronomy		
						Humanities	3	x
Total Hours		16			Total Hours		17	
Year 4				Year 4				
Fall Semester				Spring Semester				
Course No.	Course Name	Hrs	Gen Ed	Course No.	Course Name	Hrs	Gen Ed	
BIO 4104	Microbiology	4		TIBI 4826	Teaching Internship in the Secondary Schools	12		
	Fine Arts	3	X					
SCED 4713	Educational Measurements with Computer Applications	3						
GEOG 3723	Introduction to Physical Geography: Weather and Climate	3						
	OR							
GEOG 4633	Climatology							
EDSC 4593	Materials and Methods for Teaching Science in Secondary Schools	3						
Total Hours		16		Total Hours		12		
Total Jr/Sr Hours				52	Total Degree Hours		120	

As 4-years plans do not apply for the 3 Master's degrees offered through the department of Biological Sciences Graduation Check Sheets for these degrees are given in Table 5.

Table 5. Graduation Check Sheets for MS and MA in Biology, and PSM in Biotechnology:

ARKANSAS STATE UNIVERSITY COLLEGE OF SCIENCES AND MATHEMATICS		DEGREE & MAJOR: M.S.: BIOLOGICAL SCIENCES	
NAME:		ADDRESS:	
SOCIAL SECURITY #:		COMMITTEE CHAIR:	
Course		Course	
No	grade	No	grade
ADMISSION REQUIREMENTS:		BIOLOGY 5000 CONTINUED	
1) A minimum of 18 undergraduate hours in biological sciences and undergraduate grade point of 2.75 or greater (on 4.0 scale)		BIO 5131 Cell Biology Lab &	Sp
2) A minimum GRE combined verbal and quantitative score of 1000.		BIO 5133 Cell Biology	Sp
3) Three letters of reference.		BIO 5013 Population Genetics	Sp even
4) A statement of educational objectives and career goals.		BIO 5103 Virology	F even
		BIO 5113 Immunology &	F
		BIO 5111 Immunology Lab	F
		BIO 5313 Biospeleology: Life in Darkness	F even
		BIO 5353 Marine Mammals Lab &	Sp odd
		BIO 5323 Biology of Marine Mammals	Sp odd
		BIO 5123 Cell Signaling	Sp odd
		BIO 5143 Pharmacology	Sp
		BIO 5353 Marine Mammals Field Course	Sp odd
		BIO 5601 Limnology Lab &	F odd
		BIO 5603 Limnology	F odd
		BIO 5023 History of Biological Ideas	F odd
		BIO 504v 1-3 hrs Special Topics Bi Science	All
MAJOR REQUIREMENTS - BIOLOGY: 30 HOURS + TOOL		BOTANY 5000	
A minimum of three courses at the 6000 level. One course each of three different emphasis areas at the 6000 level from any Biology, Botany, Entomology, Environmental, and Zoology.		BIO 5511 Plant Physiology Lab &	
Additional 20 credits (3 prefixes, 2 additional 6000 level courses) selected from the following list and approved by thesis committee.		BIO 5513 Plant Physiology	
REQUIRED COURSES		BIO 5521 Wetlands Plant Ecology Lab &	
BIO 6003 Scientific Methods Rsch Design	F	BIO 5522 Wetlands Plant Ecology	
BIO 6001 Biological Seminar	All	BIO 5531 Aquatic Plants &	
BIO 638V 1-6 Thesis hours (6 hrs total)	All	BIO 5532 Aquatic Plants Lab	
TOOL COURSE: (3 - 4 hours)		BIO 5541 Mycology Lab &	
Title of Tool Course:		BIO 5542 Mycology	
BIOLOGY 6000		BIO 5551 Medical Mycology Lab &	
BIO 6103 Genetic Engineering	Su odd	BIO 5552 Medical Mycology	
BIO 6301 Aquatic Biology &	OOR	ENTOMOLOGY 5000	
BIO 6302 Aquatic Biology Lab	OOR	BIO 5301 Aquatic Entomology &	
BIO 6013 Evolutionary Biology	F even	BIO 5302 Aquatic Entomology Lab	
BIO 680V 1-3 hrs Independent Study	All	ENVIRONMENTAL 5000	
BOTANY 6000		BIO 5613 Conservation Biology	
BIO 6503 Mechanisms of Speciation	Sp even	BIO 5261 Environmental Microbiology Lab &	
BIO 6501 Adv. Plant Taxonomy &	Sp odd	BIO 5263 Environmental Microbiology	
BIO 6502 Adv. Plant Taxonomy Lab	Sp odd	BIO 5611 Radiation Safety	
ENTOMOLOGY 6000		BIO 5633 Environ Toxicology:Mech & Imp.	
BIO 6311 Med./Vet. Entomology Lab &	Sp even	ZOOLOGY 5000	
BIO 6312 Med./Vet. Entomology	Sp even	BIO 5311 Fishery Biology &	
BIO 6321 Insect Taxonomy Lab &	F even	BIO 5312 Fishery Biology Lab	
BIO 6322 Insect Taxonomy	F even	BIO 5351 Mammalogy Lab &	
BIO 6513 Global Change Biology	F even	BIO 5352 Mammalogy	
ENVIRONMENTAL 6000		BIO 5362 Applied Aquaculture	
BIO 6653 Aquatic Ecotoxicology	F odd	BIO 5372 Applied Fisheries	
BIO 6601 Envr. Sys. Analysis Lab &	Sp odd	BIO 5361 Mammalian Neurobiology Lab &	
BIO 6603 Envr. Systems Analysis	Sp odd	BIO 5363 Mammalian Neurobiology	
BIO 6613 Remote GIS & Geo. Info. Systems	F odd	BIO 5371 Animal Ecology Lab &	
BIO 6621 Case Studies in Ecostym Mgmt Lab &	F odd	BIO 5373 Animal Ecology	
BIO 6623 Case Studies in Ecostym Mgmt	F odd	BIO 5382 Parasitology &	
ZOOLOGY 6000		BIO 5392 Parasitology Lab	
BIO 6331 Comparative Ethology Lab &	Su odd	BIO 5401 Ichthyology Lab &	
BIO 6332 Comparative Ethology	Su odd	BIO 5402 Ichthyology	
BIO 6342 Natural Hist of Vertebrates &	Sp odd	BIO 5403 Comperative Vertabrate Reproduction	
BIO 6352 Natural Hist of Vertebrates Lab	Sp odd	BIO 5411 Herpetology Lab &	
BIO 6343 Cell & Molecular Neurobiology	F odd	BIO 5412 Herpetology	
BIO 6362 Endocrinology &	Sp even	BIO 5421 Ornithology Lab &	
BIO 6372 Endocrinology Lab	Sp even	BIO 5423 Ornithology	
BIO 6351 Comparative Physiology Lab &	Su even	Courses Not Listed:	
BIO 6353 Comparative Physiology	Su even		
BIOLOGY 5000			
BIO 5001 Lab Tech in Elec. Microscopy &	F even		
BIO 5003 Lab Tech in Elec. Microscopy Lab	F even		
BIO 5014 Microbiology	FS Su even		
BIO 5201 Issues in Human Ecology Lab &	Sp odd		
BIO 5202 Issues in Human Ecology	Sp odd		
BIO 5211 Human Genetics Lab &	F odd		
BIO 5213 Human Genetics	F odd		

ARKANSAS STATE UNIVERSITY		DEGREE & MAJOR: M.S.: BIOLOGICAL SCIENCES			
COLLEGE OF SCIENCES AND MATHEMATICS		BIOTECHNOLOGY EMPHASIS			
		CATALOG YEAR: <u>2009-2010</u>			
NAME: _____		ADDRESS: _____			
ASU ID #: _____		COMMITTEE CHAIR: _____			
		course no.	grade		
ADMISSION REQUIREMENTS:		Courses Not Listed:			
____ 1) A minimum of 18 undergraduate hours in biological sciences and undergraduate grade point of 2.75 or greater (on 4.0 scale)					
____ 2) A minimum GRE combined verbal and quantitative score of 1000.					
____ 3) Three letters of reference.					
____ 4) A statement of educational objectives and career goals.					
MAJOR REQUIREMENTS - BIOLOGY: 36 HOURS					
REQUIRED COURSES 26 credits					
BIO 6003 Scientific Methods and Research Design	_____	_____			
BIO 6141 Introduction to Biotechnology (1)	_____	_____			
BIO 6033 Biosafety and Ethics in Research (3)	_____	_____			
BIO 6144 Laboratory in BioTechniques I (4)	_____	_____			
BIO 6154 Laboratory in BioTechniques II (4)	_____	_____			
BIO 5133/5131 Cell Biology and Lab (4)	_____	_____			
CHEM 5243/5241 Biochemistry and Lab (4)	_____	_____			
TOOL COURSE: (3 - 4 hours)					
Title of Tool Course: _____					
ELECTIVES 10 credits					
MBS 6213 Advanced Cell Biology (3)					
BIO 6233 Specialized Biochemistry (3)					
MBS 6243 Molecular Genetics and Genomics (3)	_____	_____			
BIO 5013 Population Genetics (3)	_____	_____			
BIO 5103 Virology (3)	_____	_____			
BIO 5113/5111 Immunology and Lab (4)	_____	_____			
BIO 5123 Cell Signaling (3)	_____	_____			
BIO 5143 Pharmacology (3)	_____	_____			
BIO 6023 Genetic Engineering (3)					
BIO 5123/5211 Human Genetics and Lab (4)	_____	_____			
BIO 6543 Cell & Molecular Neurobiology (3)	_____	_____			
BIO 6702 Endocrinology (2)					
BIO 6133 Bioinformatics and Applications (3)	_____	_____			
BIO 5611 Radiation Safety (1)	_____	_____			
BIO 5104 Microbiology (4)	_____	_____			
BIO 5001/5003 Lab Techniques in Microscopy and Lab (4)	_____	_____			

Faculty

Currently, there are 29 faculty positions that contribute to the mission of the department. Of these 17 are tenure-track positions. Additionally we have three full-time instructors that hold positions with budget lines (Julie Huggins, Tracy Klotz, and Rebecca Parr). The Department has two open searches for tenure track positions (Ornithology and Aquatic Biology) and two tenured ABI associated faculty will have their full appointment in the Department beginning July 1, 2013 (Cramer and Medina-Bolivar). Thus, by fall of 2013 the Department will have 23 full time faculty including 21 tenure-track positions. Currently, there are 6 pre-tenured faculty. Diane Gilmore has been a full-time adjunct that has been funded off budget for the past 8 years. Additionally, three temporary faculty have been teaching full to part time and have been funded by faculty buy-out and/or salary savings from vacant positions. Dr. John Harris has been a research active adjunct working off of soft money. The College of Sciences and Mathematics has a pre-professional advisor, Kaylynne Glover, who teaches First Year Experience classes in the department as well. Finally, Dr. Yu is a pre-tenured ABI faculty with an adjunct appointment that contributes to the teaching, research, and service components of the department. Table 5 gives details of faculty appointments in the department and for other faculty associated with the department.

Table 5 – Faculty appointments and Adjunct Faculty

NAME, RANK, TITLE	SALARY	NOTES / ADMINISTRATIVE DUTIES
BENNETT, BOB - Ph.D.	\$ 60,189.00	
Associate Professor Environmental Biology		
BOULDIN, JENNIFER - Ph.D.	\$ 58,613.00	Director Ecotoxicology Facility
Associate Professor Environmental Biology		
CRAMER, CAROLE - Ph.D.	\$ 170,000.00	*Joins Department July 2013
Professor Molecular Biology (ABI)		
DOLAN, MAUREEN - Ph.D.	\$ 73,477.00	Pre-tenure
Associate Professor Cell Biology		
FARRIS, JERRY - Ph.D.	\$ 87,726.00	
Professor Environmental Biology		
GILMORE, DAVID - Ph.D.	\$ 61,638.00	Application for Promotion Pending
Assistant Professor Microbiology		
GILMORE, DIANE - D.O.	\$ 29,942.00	
Temporary full time Instructor		
GLOVER, KAYLYNNE -MA	\$ 32,640.00	*Non-Tenure Track
Preprofessional Advisor Biology / Chemistry		
GRIPPO, ANNE - Ph.D.	\$ 96,000.00	*Application for Promotion Pending
Associate Professor Biology		Associate Dean CSM
GRIPPO, RICHARD - Ph.D.	\$ 74,606.00	
Professor Environmental Biology		
HARRIS, JOHN - Ph.D.		Non-Tenure Track

Adjunct Research Assistant Professor		
HUDSPETH, JANA - MS	\$ 4,399.92	Non-Tenure Track
Temporary part time Instructor		
HUGGINS, JULIE - Ed.D.	\$ 40,412.00	Non-Tenure Track
Instructor		
HUGGINS, JOHN - MS	\$ 29,000.00	Non-Tenure Track
Temporary part time Instructor		
HUSS, MARTIN - Ph.D.	\$ 60,195.00	
Associate Professor Botany		
JOHNSON, RONALD -D.A.	\$ 83,572.00	Assoc Chair Biological Science
Professor Zoology		
KLOTZ, TRACY - MS	\$ 42,500.00	*Non-Tenure Track
Instructor / Infrastructure		
MARSICO, TRAVIS - Ph.D.	\$ 54,631.00	Pre-tenure
Assistant Professor Botany		
MCKAY, TANJA - Ph.D.	\$ 60,194.00	Associate Director EVS
Associate Professor Entomology		Director EVS - July 1
MEDINA-BOLIVAR, FABRICIO - Ph.D.	\$ 99,599.00	*Joins Department July 2013
Associate Professor of Metabolic Engineering		
PARR, REBECCA - Ph.D.	\$ 56,100.00	*Non-Tenure Track
Instructor Biotechnology		Director PSM Biotech
RISCH, THOMAS - Ph.D.	\$ 99,910.00	*Chair Biological Sciences
Professor of Animal Ecology		EVS Director
ROLLAND, VIRGINIE - Ph.D.	\$ 54,631.00	Pre-tenure
Assistant Professor Quantitative Wildlife Ecologist		
SIKKEL, PAUL - Ph.D.	\$ 55,682.00	Pre-tenure
Assistant of Marine Biology		
SRIVATSAN, MALATHI - Ph.D.	\$ 64,227.00	Application for Promotion Pending
Associate Professor of Neurobiology Biology		Assoc Director ABI/ Director MBS
STEPHANS, NATE - MS	\$ 29,000.00	Non-Tenure Track
Temporary part time Instructor		
TRAUTH, STANLEY - Ph.D.	\$ 77,593.00	
Professor of Zoology		

YU, SHIGUANG (ABI) - Ph.D.	\$ 89,301.00	*Pre-tenure
Assistant Professor		
ZHOU, JASON -- Ph.D.	\$ 53,560.00	Pre-tenure
Assistant Professor of Cell Biology		
		* 12 month salary

Teaching Loads:

The State of Arkansas mandates that all university faculty in tenure positions teach 12 credit hours per semester and full time instructors teach 15 credit hours per semester. Traditionally teaching loads have been managed to allow research active faculty time for research with reassignment time. However, with increasing scrutiny of reassignment time a more quantitative model is required. Thus the College of Sciences and Mathematics is currently developing a formula that recognizes the teaching component of research. A new policy will be in effect by fall of 2013. Below is the current draft of the teaching load formula.

Teaching Load Equivalencies College of Sciences and Mathematics Creation of Faculty Credit Hours

Current Teaching Loads (Section III.b in Faculty Handbook)

The teaching loads for faculty at ASU are defined in the Faculty Handbook in Section III.b. The major highlights of this section are:

- The standard teaching load is 15 hours per semester for instructors, 12 hours per semester for tenure track faculty, 6 hours per semester for chairs, and 3 hours per year for deans. Reductions from these values can occur when resources allow it, if approved by the chair, director, and/or dean.
- Faculty who chair masters theses for 3 different students earn one three-hour reassignment. There is no mention of reassignment for chairing a Ph.D. dissertation committee.
- Internships and/or practicums generate workloads according to a schedule of 1) 0 hours for fewer than 3 students or fewer than 9 credit hours; 2) 1 hour for at least 3 students and at least 9 credit hours; 3) 2 hours for at least 5 students and at least 15 credit hours; and 4) 3 hours for at least 7 students and at least 21 credit hours.

The fact that these guidelines mention reassignment time for chairing masters theses but not any for chairing Ph.D. dissertations means that they were written decades ago when Arkansas State University had a different mission and faculty research followed a different path. ASU has now been designated a research institution, which means that we need to have guidelines to promote this in the complete faculty workload. Furthermore, students, both undergraduate and graduate, are central to the research enterprise, and as such, research is a primary method of teaching. The old image of a faculty member working by himself or herself in a lab or library all alone is a thing of the past; the even older image of students working as apprentices in research and learning by doing is now the normal and expected situation. As such, research with students can no longer be seen as a separate entity from teaching, and we need to amend these guidelines to account for this.

Another problem with these guidelines is that the teaching load for faculty is completely determined by the credit hours received by students. Nowhere in any of these guidelines is there a mention of how much work is required by the faculty member to teach these classes. A laboratory class that awards a student one hour of credit even though it meets for three hours per week is that way because the effort of the student does not require quizzes, tests, reading large textbooks, etc. like it does in a standard 3-hour lecture class. This view,

though, does not take into account the workload of the faculty member who might need to write the lab manual, set-up the lab, run the lab with students, take down the lab, clean up, and grade the lab reports and lab books. For this reason, we need to develop the idea of a **faculty credit hour** system that takes into account the amount of work required of faculty to give the students a quality learning experience.

The Faculty Handbook does allow individual colleges to create guidelines like this that go beyond these in order to meet the research or creative projects needs of faculty and students. Therefore, we propose the following guidelines to be used in the College of Sciences and Mathematics. They are still based on the guidelines above, but they also define how various learning activities that involve students will play into teaching loads.

Suggested Teaching Load Guidelines

The teaching loads for all faculty members will be as stated in the Faculty Handbook, with the term faculty credit hours (FCH) replacing the term credit hours. The equivalence between the two will be determined as below. Please note that each of the equivalencies carries with it quantifiable and measurable expectations and outcomes that must be met. Failure to meet these expectations and outcomes by a faculty member means either that the equivalent credit hours cannot be used in the computation of his or her load or that the faculty member will be found to be failing to meet expectations in terms of teaching.

- For any course not mentioned below, a faculty member will earn faculty credit hours according to the credit hours listed on the course for students.
- Lab Instruction: The differential between the number of contact hours and the credit hours for laboratory classes is a reflection of the fact that students spend less time outside of lab preparing for the material than they do for a lecture class (ADHE Credit Hour Definition). As stated above, the workload for a faculty member can be much larger than the credit hour system. For instructors who are running the entire lab with no TA or grader help, each 1.5 contact hours/week of direct supervision in lab courses is equivalent to 1.0 FCH of instruction. For instructors who are only teaching the lab and are not performing other duties such as setting up, cleaning, and grading, only the stated credit hours for the lab are given, i.e. 1 FCH = 1 CH. For faculty who are doing some, but not all of the duties, the translation will be negotiated with the chair.
- TA Oversight: Part of the educational experience for our graduate students is for them to learn teaching skills in preparation for their later careers. Because of this, some lab and lower-division course sections heavily involve graduate students in the teaching of the material. While a faculty member is the instructor of record, the TA's in these sections handle the presentation of the materials, the set up and clean up of the lab, and the grading of the reports, tests, and homework. The faculty member, though, should be heavily involved in training and mentoring the TA, as well as the selection and creation of course materials and the handling of all student issues that arise in the class or lab. For those faculty who hold extended training sessions for TA's prior to the semester, select, create, and modify all course and testing materials, and meet with TA's on a regular basis throughout the semester, each 3 sections of the course overseen are equivalent to the credit hours of one section of the course (1 FCH = 3 CH). For faculty who only oversee the TA's during the semester and see to student issues that arise, each 6 sections of the course overseen are equivalent to the credit hours of one section of the course (1 FCH = 6 CH).

- **Intern Supervision:** In our science education curricula, each student must take one semester of internship in order to graduate. Further, we occasionally have students in other majors who seek out opportunities to intern with companies or non-profits. In these cases, a faculty member will be called upon to create expectations for the student's experience, visit the site to measure the student's performance, and provide feedback and a grade. For this level of effort, each 7 SCH of internship or practicum supervised is equivalent to 1.0 FCH of instruction.
- **Undergraduate Research Supervision:** For the College of Sciences and Mathematics, a research experience is an integral part of the education of our undergraduate students. Several of our majors directly require this, while almost all of the others encourage students to take part in research before graduation. The amount of instructional effort required of faculty to properly do this needs to be recognized. Supervision of 6 SCH of undergraduate research is equivalent to 1 FCH of instruction. The expectation is that this research will lead to a presentation of research at a conference, public viewing (Ex. Legislative Day), or publication of research in public venue (Ex. journal or magazine, status report).
- **Thesis and Dissertation Supervision:** A thesis or dissertation by a graduate student requires a fair amount of instructional effort on the part of the faculty advisor. Supervision as the committee chairperson of 6 SCH of a master's level thesis or a Ph.D. dissertation study is equivalent to 1 FCH of instruction. Credit is limited to 6 SCH for a given thesis and 36 for a given dissertation. Expectations for dissertation hours requires the publication of the research in a national peer-reviewed journal, while thesis hours require presentation at a conference for a national organization, at a minimum.
- **Large Classes:** The workload for teaching a large section can be much greater than that for a smaller one. This is especially true if evaluative feedback is being given to students through office hours, e-mail, and graded assignments. This applies for both traditional and online courses. The following weight factors will apply to classes with the listed enrollment, i.e. the number of FCH = weight factor times CH:
 - 49 students or less = 1.0
 - 50-59 students = 1.1
 - 60-69 students = 1.2
 - 70-79 students = 1.3
 - 80-89 students = 1.4
 - 90-99 students = 1.5
 - 100-109 students = 1.6
 - 110-119 students = 1.7
 - 120-129 students = 1.8
 - 130-139 students = 1.9
 - 140-149 students = 2.0
 - 150+ = Keep increasing by .1 for every 1 students.

The expectation is that the assessment of learning in these courses will be similar/equivalent to that of other courses with enrollments less than 50 students.

- **Team Teaching:** Participants in team-taught courses will work out the distribution of work, which will be entered in Banner, and each will receive credit for the course proportionally.

References

ASU Faculty Handbook - <http://academicaffairs.astate.edu/facultyhandbook/Final3.5.2010.pdf>

ADHE Definition of a Credit Hour -

<http://www.adhe.edu/SiteCollectionDocuments/AcademicAffairsDivision/ICAC%20Rules%20and%20Regulations/APPENDIXH.pdf>

Arkansas Funding Formula for Higher Ed - <http://www.arkleg.state.ar.us/assembly/2005/R/Acts/Act1429.pdf>

Startup Packages

Startup packages are negotiable with a standard package including 3 months of summer salary and \$40,000 that is largely unrestricted under normal university policies. However, the above has been a minimum offer and recent startups have ranged up to \$210,000 that is largely unrestricted under normal university policies.

Research

The faculty listed in Table 5 contribute to the active research mission of the Department of Biological Sciences. Research ranges from molecular to ecological levels of investigation. The following list organizes research productivity by faculty member and includes publications, presentation, grants, and patents from 2010 until the present. In total are 138 publications, 279 presentations, 94 grants and 8 patents. Reflective of the collaborative nature of the department, not all of this tally is unique, as some outputs may be listed under more than one faculty for collaborative works.

Carole L. Cramer, PhD

Professor

Publications - Cramer

- Hood, E., **C.L. Cramer**, G. Medrano, and J. Xu. 2012. Protein targeting: Strategic planning for optimizing protein products through plant biotechnology. Chapter 3 in: *Plant Biotechnology and Agriculture: Prospects for the 21st Century*, A. Altman, P.M. Hasagawa (eds.), Elsevier, pp. 35-54.
- Medrano, G., M.C. Dolan, J. Condori, D.N. Radin, and **C.L. Cramer**. 2012. Quality assessment of recombinant proteins derived from plants. In: *Recombinant Gene Expression: Reviews and Protocols*, Third Edition. A. Lorence (ed.) Humana Press/Springer, New York, p. 535-564.
- Dolan, M.C, G. Medrano, A. McMickle, and **C.L. Cramer**. 2012. Tools of the trade: Developing antibody-based detection capabilities for recombinant proteins. In: *Recombinant Gene Expression: Reviews and Protocols*, Third Edition. A. Lorence (ed.) Humana Press/Springer, New York, p. 65-105.
- Ashby, C., K. Wang, **C.L. Cramer** and X. Huang. 2012. Study of protein structure alignment problem in parameterized computation. *Proc .Internat. Conf. Bioinform. Models Meth. Algorithms*. Pp. 174-181; [http://www.scitepress.org/ DigitalLibrary](http://www.scitepress.org/DigitalLibrary). DOI: 10.5220/0003769701740181.
- Xu, J., M.C. Dolan, G. Medrano, **C.L. Cramer**, and P.J. Weathers. 2011. Green factory: Plants as bioproduction platforms for recombinant proteins. *Biotechnol. Adv.*, (doi: 10.1016/j.biotechadv. 2011.08.020).
- Aly, R., N. Hamamouch, J. Abu-Nassar, S. Wolf, D.M. Joel, H. Eizenberg, E. Kaisler, **C. Cramer**, A. Gal-On, and J.H. Westwood. 2011. Movement of protein and macromolecules between host plants and the parasitic weed *Phelipanche aegyptiaca* Pers. *Plant Cell Rep.* 30:2233–2241.
- Walker, K, **C. Cramer**, S. Jennings, and X. Huang. 2011. TERPRED: A dynamic structural data analysis tool, Proceedings of the World Congress on Computer Science and Information Engineering, 2011. [In Recent Advances in Computer Science and Information Engineering, Volume 2; Z. Qian, L. Cao, W. Su, T. Wang, and H. Yang (Eds.), pages 781-788.
- Johnson, D., K. Wang, **C.L. Cramer** and X. Huang. 2011. Graph-Based approach for gene markers and applications in Next-Generation Sequencing data analysis. **BCB '11** Proceedings of 2nd ACM Conference on Bioinformatics, Computational Biology and Biomedicine. Pp. 511-513, New York, NY, USA 2011 [ISBN: 978-1-4503-0796-3]
- Medrano, G., N.T. Stephens, A. McMickle, M.C. Dolan, G. Erf, D.N. Radin, and **C.L. Cramer**. 2010. Efficient plant-based production of chicken IL-12 yields a strong immunostimulatory cytokine. *J Interferon Cytokine Res.* **30**(3):21-31.

Presentations - Cramer

- Condori, J., Acosta, W., Ayala, J., Flory, A., Radin, D.N. and Cramer, C.L. (2013) Plant lectins: Exploiting carbohydrate affinity for delivery of enzyme replacement therapeutics, Glycobiology Gordon Research Conference, Redondo Beach, CA.
- Cramer, C.L., Acosta, W., Ayala, J., Condori, J., and Radin, D.N. (2013) Plant lectin-mediated ERT delivery provides a novel mechanism for cell uptake leading to correction of lysosomal disease pathology. WORLD Congress of Lysosomal Disease Network; Orlando FL.
- Cramer, C.L. (2012). Plant-based bioproduction of pharmaceutical proteins – pushing the ‘medicinally active’ envelope. 3rd Annual Conferences of American Council for Medicinally Active Plants and P3 Center Annual Research Symposium, Jonesboro, AR.

- Cramer, C.L. (2012). Plant-based bioproduction of pharmaceutical proteins: Using cross-disciplinary approaches from informatics to immunology. Invited lectures, bioinformatics workshop, School of Mathematics, Shandong University, Jinan, China.
- Cramer, C.L. (2012). Plant-based bioproduction of pharmaceutical proteins: Using cross-disciplinary approaches from informatics to immunology. Invited seminar, School of Life Science, Shandong University, Jinan, China.
- Cramer, C.L. (2012). The Power of Cross-Disciplinary Research – using multi-disciplinary collaborations to enhance innovation, discovery, competitiveness, and entrepreneurship . Invited seminar, Chinese Academy of Science (CAS) Institute of Applied Mathematics in Beijing City, China
- Cramer, C.L. (2012). Plant-based bioproduction of pharmaceutical proteins: Using cross-disciplinary approaches from informatics to immunology to drive innovation. Invited seminar, Chinese Academy of Science (CAS) Institute of Process Engineering, Beijing City, China
- Acosta, W., Ayala, J., Behrens, A., Bailey, J., Dolan, M.C., & Cramer, C.L. (2012). Plant-made pharmaceutical proteins: Targeting enzyme bioproduction and delivery. 3rd Annual Conference of American Council for Medicinally Active Plants and P3 Annual Research Symp, Jonesboro, AR.
- Cramer, C.L. (2012). Teaching and research at an undergraduate university --- and how to market your discoveries. UAMS 12th Annual Career Day, Little Rock, AR.
- Cramer, C.L. (2012). The biology side of transcriptomics and bioinformatics – an research example using IL-12. Bioinformatics Workshop lecture, Shandong University, Jinan, China.
- Cramer, C.L. (2012). The Power of Cross-Disciplinary Research – using multi-disciplinary collaborations to enhance innovation, discovery, competitiveness, and entrepreneurship. Beijing University, Beijing
- Cramer, C.L., Dolan, M.C., Acosta, W., Medrano, G., & Radin, D.N. (2011). Advances in Plant-Based Bioproduction Strategies for Human Lysosomal Enzymes. Gordon Research Conference on Lysosomal Diseases, Galveston, TX.
- Acosta, W., Ayala, J., Reidy, M.J., Dolan, M.C., & Cramer, C.L. (2011). A novel strategy to deliver enzyme replacement therapeutics into mammalian cells. Gordon Research Conference on Lysosomal Diseases, Galveston, TX.
- Jarrett, M., Fergus, M., Dolan, M.C., & Cramer, C.L. (2011). Developing Plant-Expressed RTB Fusion Protein Tools for Animal Cell Targeting and Delivery. Create@AstAte Research Symposium, Jonesboro, AR.
- Elkins, L.L., Ayala, J., Fergus, M., Dolan, M.C., & Cramer, C.L. (2011). Developing Vaccine Antigen Fusion Proteins in Plants. Create@AstAte Research Symposium, Jonesboro, AR.
- Jarrett, M., Fergus, M., Cramer, C.L., & Dolan, M.C. (2011). Development of a plant-produced RTB:EGFP protein for exploring RTB trafficking in animal cells. Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, Heber Springs, AR.
- Wu, D., Dolan, M.C., Xu, J., & Cramer, C.L. (2011). Hydroxyproline-O-glycosylation Improves Yields of Protein Transiently Expressed in Tobacco Plants. Create@AstAte Research Symposium, Jonesboro, AR.
- Stephens, N.S., Cramer, C.L., Trauth, S., & Dolan, M.C. (2011). Molecular Ecology of Western Slimy Salamanders in the Spillway Mine, Garland Co., AR.. Joint Meeting of American Societies of Ichthyologists and Herpetologists, Minneapolis, MN.
- Stephens, N.S., Cramer, C.L., Trauth, S., & Dolan, M.C. (2011). Molecular Ecology: Slimy Salamander STRs. Create@AstAte Research Symposium, Jonesboro, AR.
- Acosta, W., Ayala, J., Dolan, M.C., & Cramer, C.L. (2011). Molecular Pharming: a renewable alternative for plant-based bioproduction of high value therapeutics.. National EPSCoR Annual Conference, Coeur d'Alene, ID.

- Acosta, W., Ayala, J., Dolan, M.C., & Cramer, C.L. (2011). Plant-made pharmaceuticals – RTB fusions as a novel strategy for delivering lysosomal enzyme therapeutics into mammalian cells. Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, Heber Springs, AR. (1st Place Grad Student Award)
- Medrano, G., Rubio, N.A., Radin, D., & Cramer, C.L. (2011). Plant produced porcine IL-12 vaccine adjuvant for swine flu and other viral diseases. AR P3 Symposium & AR NSF EPSCoR Annual Meeting, Heber Springs, AR.
- Elkins, L.L., Ayala, J., Fergus, M., Cramer, C.L., & Dolan, M.C. (2011). Plant transient expression of Ova antigen:RTB fusions for production of improved subunit vaccines. Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, Heber Springs, AR.
- Cramer, C.L. (2010). Arkansas Agriculture and Food Processing. Invited presentation as part of conference *on Building the Arkansas Innovation Economy*. National Research Council of the National Academies Conferences as part of the series on *Competing in the 21st Century: Best Practices in State and Regional Innovation Initiates*. Little Rock, AR
- Cramer, C.L. (2010). CSI Camp, Arkansas. Engaging America's Talent - NSF Educational Outreach Conference, Little Rock, AR.
- Ayala, J., Acosta, W., Ashby, C., Johnson, D., Reidy, M.J., Fergus, M.R., Dolan, M.C., Huang, X., & Cramer, C.L. (2010). Engineering the RTB lectin to impact bioproduction, trafficking, and delivery of associated fusion proteins into mammalian cells. 12th Annual IAPB/SIVB Conference, St. Louis, MO.
- Medrano, G., Dolan, M.C., Rubio, N., McMickle, A., Radin, D., & Cramer, C.L. (2010). Plant-based production platform compatible with veterinary vaccine applications for producing functional avian interleukin-12. 12th IAPB/SIVB Congress, St. Louis, MO.
- Medrano, G., Dolan, M.C., Ayala, J., Rubio, N., Stephens, N.T., Radin, D., Huang, X., & Cramer, C.L. (2010). Plant-based vaccine components targeting immune presentation and response. Immune Correlates of Protection Against Influenza: Challenges for Licensure of Seasonal and Pandemic Influenza Vaccines, Orlando, FL.
- Cramer, C.L. (2010). Plant-based Vaccines and Therapeutics: It's all in the Delivery. ABI Annual Fall Research Symposium (keynote). Little Rock, AR.
- Medrano, G., Dolan, M.C., Rubio, N., McMickle, A., Radin, D., & Cramer, C.L. (2010). Production of bioactive chicken interleukin-12 in plants. Developing antibodies and quantification tools. NSF-Experimental Program to Stimulate Competitive Research (EPSCoR), Plant Powered Production (P3) Symposium. Petty Jean, AR.
- Ashby, C., Ayala, J., Johnson, D., Jennings, S.F., Cramer, C.L., & Huang, X. (2010). Protein Structure Prediction Based on Efficient Sequence-Structure Alignment. The Seventh Annual Conference of the MidSouth Computational Biology and Bioinformatics Society, Jonesboro, AR.

Grants - Cramer

- McClure, G., Cramer, C.L., Varadan, V., & Mantooth, A. (2012). Arkansas ASSET II. National Science Foundation EPSCoR RII Program - \$20 M.
- Cramer, C.L., Yu, S., & Dolan, M.C. (2012). RTB-mediated delivery: Orchestrating antigen trafficking to enhance cell immunity. National Institutes of Health - \$374,000.
- Cramer, C.L. (2012). SURF: Mammalian Cell-Based Assessment of Enzyme Therapeutics; Jessica Bailey. Arkansas Science and Technology Authority - \$4000.
- Cramer, C.L., Srivatsan, M., Dolan, M.C., Buchanan, R., & Yu, S. (2010). MRI-R2 Acquisition of Equipment for Investigating Biodynamic Interactions. National Science Foundation - \$1,070,851.

Maureen C. Dolan, Associate Professor of Cell Biology

Publications – Dolan

Xu, J., **Dolan, M. C.**, Medrano, G., Cramer, C. L., Weathers, P. J. (2012). Green Factory: Plants as bioproduction platforms for recombinant proteins. **30(5)**: 1171-1184.

Dolan, M.C.*, Medrano, G., McMickle, A. and Cramer C.L. “Tools of the trade: Developing antibody-based detection capabilities for recombinant proteins”. (2011). In A. Lorence (ed.) (Ed.), *In: Recombinant Gene Expression: Reviews and Protocols, Third Edition*. (pp. Pp 65-105). New York: Humana Press/Springer. * Corresponding author.

Medrano, G., **Dolan, M.C.**, Condori J., Radin D. and Cramer C.L. “Quality Assessment of Recombinant Proteins Produced in Plants”. (2011). In A. Lorence (ed.) (Ed.), *In: Recombinant Gene Expression: Reviews and Protocols, Third Edition*. (pp. Pp 535-564). New York: Humana Press/Springer.

Xu, J., Ge, X., and **Dolan M.C.** (2011). Towards High-Yield Production of Therapeutic Proteins with Plant Cell Suspension Culture. *Biotechnol Advances*, **29(3)**, 278-299.

Sivakumar G., Medina-Bolivar F., Lay J.O., **Dolan M.C.**, Condori J., Wright S.M., Baque A., Lee E-J and Paek K.Y. (2011). Bioprocess and Bioreactor: Next generation technology for production of potential plant-based antidiabetic and antioxidant molecules. *Current Medicinal Chemistry*, **18(1)**:79-90.

Medina-Bolivar, F., Condori, J., Nopo-Olazabal, C., Carrier, D. J., Nair, V., Atwill, R. L., Baker, J., Nopo-Olazabal, L., **Dolan, M. C.** (2010). Controlled production of stilbenoids in hairy root cultures of peanut (*Arachis hypogaea*). *Polyphenols Communications*, **1**, 42-43.

Condori J., Sivakumar G., Hubstenberger J., **Dolan MC**, Sobolev VS, and Medina-Bolivar, F. (2010). Induced biosynthesis of resveratrol and the prenylated stilbenoids arachidin-1 and arachidin-3 in hairy root cultures of peanut: Effects of culture medium and growth stage; accepted for publication. *Plant Physiology and Biochemistry*. **48(5)**:310-8.

Medrano, G., **Dolan, M.C.**, Stephens, N.T., McMickle, A., Erf, G., Radin, D. and Cramer C.L. (2010). Efficient plant-based production of chicken IL-12 yields a strong immunostimulatory cytokine. *J Interferon Cytokine Res*. **30(3)**:21-31.

Patents – Dolan

Medina-Bolivar F., **Dolan M.C.**, Bennett S., Condori J., Hubstenberger J. “Production of stilbenes in hairy roots” Patent Application N. 11773178 (**Issued** Jan. 23, 2010); European Patent Application N. PCT/US07/72756 (Pending).

Cramer, C.L., Radin, D., **Dolan, M.C.**, Medrano, G. “Plant-based expression of avian interleukin-12 and methods of producing and using same” Patent Application N.12/574,598. (**Accepted March 2012; pending Issue**) International Application 12/574,598 (Pending).

Dolan, M.C. “Lubricating the protein productivity engine with vitamins and carbs” Setpoints Session: ASSET II Plant Power Protein Annual Conference, Jonesboro, AR. May, 2012.

Dolan, M.C. “Quality Control for Healthy Foods: Why the Label is as Important as the Content” Annual Ozark Food Processors Association Annual Conference and Expo, Springdale AR, April 2012.

Dolan, M.C. “Plant-made therapeutics & vaccines: Advances impacting the animal health industry” 2012 Research Day Conference at University of Arkansas-Pine Bluff, March 2012.

Presentations- Dolan

Research Poster Presentations (Presenter; Student co-author)

Jarrett M, Ayala J, Fergus M.R., Cramer, C L., **Dolan, M.C** "Establishing the Tools to Explore the Use of a Plant-Expressed Nontoxic Lectin, RTB, in Targeting Recombinant Therapeutic Protein Delivery to Animal Cells" World Congress on In Vitro Biology (2012 SIVB) Bellevue, WA, June 3-7, 2012.

Yactayo-Chang J. , **Dolan M.C.**, Lorence A. "Stable coexpression of Vitamin C enhancing genes for improved production of a recombinant therapeutic protein, hIL-12 in Arabidopsis", 3rd Annual Conference of the American Council for Medicinally Active Plants; Jonesboro, AR, May 22-25, 2012; Co-mentored Graduate Student:

Cramer C.L., Elkins L., Medrano G., Ayala J., Condori J., Rubio N., Radin D., **Dolan M.C.** "Strategies for Eliciting Cell-Mediated Immunity in Plant-Made Vaccines"; 3rd Annual Conference of the American Council for Medicinally Active Plants; Jonesboro, AR, May 22-25, 2012. Co-mentored Graduate Student: FIRST PLACE, IN P3 GRADUATE STUDENT POSTER COMPETITION

Jarrett M, **Dolan M.C** "Plant-based Bioproduction of an Immune-Modulating Cytokine for Improving Fish Health in Aquaculture"; 3rd Annual Conference of the American Council for Medicinally Active Plants; Jonesboro, AR, May 22-25, 2012

Acosta W, Ayala J, Behrens E, Bailey J, **Dolan MC**, **Cramer CL**. "Plant-Made Pharmaceutical Proteins: Targeting Enzyme Bioproduction and Delivery". 3rd Annual Conference of the American Council for Medicinally Active Plants; Jonesboro, AR, May 22-25, 2012.

Cramer, C. L., **Dolan, M. C.**, Jarrett, M., Medrano, G., Radin, D. N. "Plant-made Cytokines for Stimulating Immune Health in Agriculturally Important Animals" NCTR Food Safety Conference, Jefferson, AR. April 11, 2012.

Cramer, C. L., **Dolan, M. C.**, Medrano, G., Ayala, J., Elkins, LL, Condori, J., Radin, D. N. "Plant-made Vaccines: Strategies for Inducing Strong Cell-Mediated Immunity" New Cells, New Vaccines VI Conference. Wilmington, DE, March 25-28, 2012.

Acosta, W., Ayala, J., **Dolan, M. C.**, Cramer, C. L., "Molecular Pharming: a renewable alternative for plant-based bioproduction of high value therapeutics." National EPSCoR Annual Conference, NSF, Coeur d'Alene, ID. September, 2011.

Jarrett, M., Fergus, M.R., Cramer, C. L., **Dolan, M. C.**, "Development of a plant-produced RTB:EGFP protein for exploring RTB trafficking in animal cells", Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, AR EPSCoR/ AR Center for Plant-Powered Production, Heber Springs, AR, July 26, 2011.

Elkins, L. L., Ayala, J., Fergus, M.R, Cramer, C. L., **Dolan, M. C.**, "Plant transient expression of Ova antigen:RTB fusions for production of improved subunit vaccines", Academic, State. (July 26, 2011). Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, AR EPSCoR/ AR Center for Plant-Powered Production, Heber Springs, AR, July 26, 2011.

Acosta, W., Ayala, J., **Dolan, M. C.**, Cramer, C. L., "Plant-made pharmaceuticals – RTB fusions as a novel strategy for delivering lysosomal enzyme therapeutics into mammalian cells", Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, AR EPSCoR/ AR Center for Plant-Powered Production, Heber Springs, AR, July 26, 2011.

Yactayo-Chang, J. P., **Dolan, M. C.**, Lorence, A. "Stable co-expression of vitamin C enhancing genes for improved expression of a recombinant therapeutic protein, hIL12, in *Arabidopsis thaliana*", Joint AR P3 Symposium & AR NSF EPSCoR Annual Meetings, AR EPSCoR/ AR Center for Plant-Powered Production, Heber Springs, AR, July 26, 2011

Acosta, W., Ayala, J., Reidy, M. J., **Dolan, M. C.**, Cramer, C. L. "A novel strategy to deliver enzyme replacement therapeutics into mammalian cells", Gordon Research Conferences, Galveston, TX, January 24, 2011.

Cramer, C. L., **Dolan, M. C.**, Acosta, W., Medrano, G., Radin, D. N. "Advances in Plant-Based Bioproduction Strategies for Human Lysosomal Enzymes", Gordon Research Conference on Lysosomal Diseases, Gordon Research Conferences, Galveston, TX, January 24, 2011.

Educational Outreach Poster Presentations

Harris, R.S. & **Dolan, M.C.** "Growing" The Biotech Educational Outreach Network; 2011 ABI Annual Symposium; Poster Presentation Little Rock, AR, September 21, 2011.

Harris, R.S. & **Dolan, M.C.** Plant Biotech Educational Outreach and Biotech-in-a-Box in Arkansas. 3rd Annual Conference of the American Council for Medicinally Active Plants; Jonesboro, AR, May 22-25, 2012.

Grants – Dolan

External Research: Principle

1. USDA SBIR Phase II

AFT/L. Applewhite (PI)

PI ASU Subcontract: M.C. Dolan

"Species Identification of Tuna in Commerce Utilizing Real Time qPCR"

1/1/13–12/31/15

\$80,000 (ASU subcontract/ \$398,000 SBIR award total)

Role: PI - ASU subcontract collaborative with small business, AFT; *Lead technical grant writer; Lead efforts to streamline DNA extraction protocols for processed fish sample compatible with commercial diagnostics; developing mini barcoding targets for definitive tuna speciation; In addition to 0.9 mo. salary, contract will support the funding of student researchers/internships.*

2. NOAA Saltonstall-Kennedy

AFT/L. Applewhite (PI)

PI ASU Subcontract: M.C. Dolan

"Species Identification of Grouper in Commerce Utilizing Real Time PCR"

9/1/10–12/31/12

\$26,000 (ASU subcontract/ \$157,000 total award)

Role: PI - ASU subcontract collaborative with small business, AFT; *Lead technical grant writer; Lead efforts to developing real time qPCR platform for fish species identification that ; In addition to 0.6 mo. salary/year (2), contract supported the funding of 2 student researchers/internships.*

External Research: Co-Principle/Collaborator

1. NIH R21

C.L. Cramer (PI)

CoPI: S. Yu; Collaborator: **M.C. Dolan**

"RTB-mediated delivery: Orchestrating antigen trafficking to enhance cell immunity"

8/15/2012 - 7/31/2014

\$366,691

Role: Collaborator with ABI/Biology Faculty with no salary commitment of 1 mo/ year (2); role in experimental design and data review; Project supports pending ASU filed patent that I am co-inventor. This project provides valuable insight into application on primary project focused on plant-expressed fish immune health therapeutics/vaccines.

2. NIH Arkansas INBRE

Program Project PIs: L. Cornett (PI)/H. Benes (Co-PI)

Seed Grant A Lorence (PI); **M.C. Dolan** (Collaborator)

"Mechanisms Leading to Enhanced Tolerance to Oxidative Stress and Increased Lifespan in Arabidopsis: Role of Mitochondrial, ER, and Chloroplastic Enzymes Involved in Ascorbate Biosynthesis"

05/01/10 – 04/30/15

\$579,198

Role: Collaborator with ABI/Chemistry Faculty supported at **0.6 mo. salary/ year (5)**; Actively involved in experimental design/collaboration on Objective 2 focused on ascorbate role in altering ER protein degradation process; co-mentor MBS PhD student. This project leveraged previous external funding from NSF EPSCoR, P3 Seed Grant (Lorence, PI; Dolan coPI in 2008-2010).

3. NSF EAGER

P. Sikkel (PI),

co-PIs: Smit, N., Davies, A. Collaborator: **M.C. Dolan**

"Blood Parasite Infections in Fishes and their Transmission by Gnathiid Isopods on Caribbean Coral"

5/31/12 – 6/1/14

\$299,120

Role: Collaborator with ASU Biology Faculty supported at **1 mo. salary/year (2)**; Leading the molecular biology component/graduate student training; integrating molecular diagnostic technology utilized in food fish commercial diagnostics for marine conservation biology.

4. NSF MRI II (Major Research Instrumentation)

I. Soek (PI)

CoPIs: B. Kemp, **M.C. Dolan**, Y. Hwang, B. Carroll, R. Engelken,

"MRI: Acquisition of a Mask Aligner for Micro/Nano-Fabrication Research at Arkansas State University"

8/1/12 – 7/31/14

\$298,578

Role: coPI with ASU Engineering team on microfabrication equipment grant; provide grant writing/editing and application innovation of fabricated materials to molecular diagnostic platform development; provide biological/molecular expertise to this team. Efforts intended to build a strong interdisciplinary team of Engineers and biologists at ASU in seeking future extramural funding.

5. NSF MRI II (Major Research Instrumentation)

C.L. Cramer (PI)

Co-PIs: R Buchanan, **MC Dolan**, M Srivatsan, S Yu

"MRI-R2 Acquisition of equipment for investigating biodynamic interaction"

1/5/10 – 7/4/12; no cost extension to May 2013

\$1,070,851

Role: coPI with team of ASU biologists focused on leveraging equipment suite for advancing studies of plant-expressed animal proteins and exploring underlying mechanisms of action on animal immunity.

6. NSF EPSCoR P3 Seed Grant #P3009,

A. Lorence(PI), **MC Dolan**, V. Srivastava

NSF EPSCoR ASSET Project 2: Plant-based Bioproduction and the Arkansas P3 (Plant-Powered Production) Center

C.L. Cramer (PI) 9/15/07-8/31/10

"Role of Ascorbate in mitigating ER and cellular stress associated with transient and stable plant-based

protein production”

5/16/08-8/31/10

\$247,500

Role: coPI

Outcomes: Data supported submission of a patent, MS Student thesis, numerous poster and oral presentations and submission of a manuscript (Apr 2012)

7. NSF EPSSCoR P3 Seed Grant #P3003, F. Medina-Bolivar(PI), J. Carrier, MC Dolan

NSF EPSCoR ASSET Project 2: Plant-based Bioproduction and the Arkansas P3 (Plant-Powered Production) Center
C.L. Cramer (PI) 9/15/07-8/31/10

“Regulation, production and purification of bioactive stilbenoids from hairy root cultures of peanut”

5/16/08-8/31/10

\$248,250

Role: coPI

Outcomes: Data supported submission and award of a patent and several publications. Core technology sublicensed by company established with F. Medina-Bolivar currently establishing in the Catalyst Incubator at Arkansas State University.

External Educational Outreach: Co-Principle

1. Arkansas Science & Technology Authority- STEM Summer Academy Grant Program

J. Grady (PI)

Co-PIs: **Dolan, M. C.**, Saarnio, D., Gill, A. (Collaborator).

"Enriching Biotech-in-a-Box Learning with Interactive Visualization Tools and Environments"

4/1/12-7/31/12

\$19,977

Role: *Conceived and led science-content development of Virtual Toolbox for BTNB Strawberry DNA in collaboration with CDI (A. Gill) and ABI (S. Harris); Participated in development and use of assessment tools led by CCE (D. Saarnio/C. Brinkley);*

Outcome: *Preliminary data for NSF DRK-12 submission Dec 2012 (PI).*

2. Arkansas Science & Technology Authority-STEM Summer Academy Grant Program

C. Miller (PI)

Co PIs: **MC Dolan** S. Harris

"Electrophoresis Biotechnology Summer Academy for Teachers & Students"

4/1/12-7/31/12

\$15,321

Role: *Co-coordinate and instruct activity in both Teacher workshop and Student Camp. One week salary for MD; 1 mo salary for R.S. Harris*

Outcome: *Development and initial beta-testing of a BTNB Electrophoresis:CSI kit to be used in high school classrooms in region with goal of statewide adoption.*

3. Arkansas Science & Technology Authority-STEM Professional Development Program

M.C. Dolan (PI)

PI: **MC Dolan**, Co PIs: S. Harris, C. Miller,

"Plant Powered Production (P3) Biotech-in-a-Box Science Instruction"

1/16/11–5/30/12

\$12,000

Role: *PI; Instructional design; Faculty Instructor & Coordinator; data collection, analysis and reporting activities. Salary for MD and RS*

Outcome: *Development and initial beta-testing of a BTNB Biofuels: kit to be used in high school classrooms in region with goal of statewide adoption.*

4. Arkansas Science & Technology Authority-STEM Professional Development Program

PI: C. Miller; Co PIs **MC Dolan**, S. Harris

"Biotechnology in Grades 10 – 12 Science Instruction-Electrophoresis BTNB"

1/16/11–1/15/12

\$12,000

Role: coPI; Faculty Instructor

Outcome: Additional beta-testing of a BTNB Electrophoresis: kit and training of 50+ teachers in Arkansas to use kit in high school classrooms with goal of statewide adoption.

Mentored-Undergraduate Research Fellowship Grants

1. Arkansas Dept. of Higher Education-Student Undergraduate Research Fellowship

Student: M. Jarrett (Chemistry, Sr.); Mentor: **MC Dolan**

"Plants as Factories for Expression of a Model Therapeutic Delivery Protein"

1/17/11–8/1/11

\$3,900

Role: Undergraduate Research Mentor: Oversee instruction, project logistics and data analysis and reporting for an undergraduate research project focused on a plant-expressed recombinant lectin for targeting animal therapeutic delivery to intended host organisms.

Outcome: Student currently working as Research Technician and actively applying to Medical and/or PhD programs for Fall 2013 acceptance.

2. Office of Technology Transfer-Student Undergraduate Research Fellowship

Student: J. Roberts (Chemistry, Sr.); Mentor: **MC Dolan**

"Plants as Factories for Expression of a Model Therapeutic Delivery Protein"

1/17/13–5/10/13

\$1,950

Role: Undergraduate Research Mentor: Oversee instruction, project logistics and data analysis and reporting for undergraduate research project focused on a plant-expressed fish antimicrobial-stimulating protein for enhancing aquaculture catfish health.

3. Arkansas Science & Technology Authority ASSET Summer 2013 Internship (ASSET-REU)

Student: A. Caparas (Biology & Chemistry, So.); Mentor: **MC Dolan**

"Plants as Factories for Expressing Fish Immune Health Promoting Therapeutics"

5/17/13–8/9/13

Funding: Student full-time stipend and supply budget

Role: Undergraduate Research Mentor: Oversee instruction, project logistics and data analysis and reporting for an undergraduate research project focused on developing strategy for extending environmental and serum half-life of a plant-expressed fish immune promoting therapeutic

Jerry L. Farris, Professor of Environmental Biology

Publications – Farris

- Peck, A. J., J.L. Harris, J.L. Farris and A.D. Christian. 2013. Survival and horizontal movement of the freshwater mussel species *Potamilus capax* (Green 1832) following relocation within a Mississippi Delta stream system. Submitted to *American Midland Naturalist* 3/26/13.
- Koontz, M.B., S.C. Pierce, L.E. Saunders, M.T. Moore, J.L. Farris and S.R. Pezeshki. 2013. Seasonal changes in nutrient allocation and growth of a wetland plant grown in constructed drainage ditches. Submitted to *Agriculture, Ecosystems, and Environment* 3/ 20/13.
- Kroger, R., Moore, M.T., Thornton, K.W., Farris, J.L., Prevost, J.D., Pierce, S.C. 2012. Tiered on-the-ground implementation projects for Gulf of Mexico water quality improvements. *Journal of Soil and Water Conservation*. 67(4):94A-99A.
- Kroger, R., Thornton, K.W., Moore, M.T., Farris, J.L., Prevost, J.D., Pierce, S.C. 2012. Tiered collaborative strategies for reducing hypoxia and restoring the Gulf of Mexico. *Journal of Soil and Water Conservation*. 67(3):70A-73A.
- Kroger, R., Pierce, S.C., Littlejohn, K.A., Moore, M.T., Farris, J.L. 2012. Decreasing nitrate-N loads to coastal ecosystems with innovative drainage management strategies in agricultural landscapes: An experimental approach. *Agricultural Water Management*. 103:162-166.
- Kroger, R., Moore, M.T., Farris, J.L. 2011. Concentrated standing tailwater: a mechanism for nutrient delivery to downstream aquatic ecosystems. *Journal of Agricultural Science and Technology Part B*. 1:773-777.
- Greenway, S.L., Moore, M.T., Farris, J.L., Rhoton, F.E. 2011. Effects of fluidized gas desulfurization (FGD) gypsum on non-target freshwater and sediment dwelling organisms. *Bulletin of Environmental Contamination and Toxicology*. 86(5):480-483
- Kroger, R., Moore, M.T., Farris, J.L., Gopalan, M. 2011. Evidence for the use of low-grade weirs in drainage ditches to improve nutrient reductions from agriculture. *Water, Air, and Soil Pollution*. 221:223-234.
- Moore, M.T., Kroger, R., Farris, J.L., Locke, M.A., Bennett, E.R., Denton, D.L., Cooper, C.M. 2011. From vegetated ditches to rice fields: Thinking outside the box for pesticide mitigation. In: Goh, K., Bret, B.L., Potter, T. Gan, J. (Eds.), *Pesticide Mitigation Strategies for Surface Water Quality*. American Chemical Society Symposium Series 1075. pp. 29-37.
- Farris, J.L., Milam, C.D., Moore, M.T., Bennett, E.R., Cooper, C.M., Smith, Jr, S., Shields Jr, F.D. 2010. Evaluating toxicity of atrazine and lambda-cyhalothrin amendments in agricultural ditch mesocosms. In: Moore, M. T. and Kroger, R. (Eds.), *Agricultural Drainage Ditches: Mitigation Wetlands for the 21st Century*. Research Signpost. Kerala, India. pp. 223-228.
- Feldman, D.L., Farris, J.L., Moore, M.T., Cooper, C.M. 2010. A Characterization of Benthic Macroinvertebrate Communities in Agricultural Drainage Ditches of the Northeast Arkansas Delta, USA. In: Moore, M. T. and Kroger, R. (Eds.), *Agricultural Drainage Ditches: Mitigation Wetlands for the 21st Century*. Research Signpost. Kerala, India. pp. 17-36.

Presentations - Farris

- Littlejohn, K.A., Kroger, R., Moore, M.T., Farris, J.L. 2011. Low-grade weirs in agricultural drainage ditches: An experimental approach to decreasing nitrate-N. Abstracts of the Joint Meeting of the Society of Wetland Scientists, Wetpol and Wetland Biogeochemistry Symposium, Prague, Czech Republic, 3-8 July, 2011. p. 417
- Moore, M.T., Kroger, R., Locke, M.A., Cooper, C.M., Farris, J.L., Bennett, E.R., Denton, D.L. 2010. From Vegetated Ditches to Rice Fields: Thinking Outside the Box for Pesticide Mitigation. 239th National Meeting of the American Chemical Society, March 21-25, San Francisco, CA. Picogram v. 78: 104.
- Bennett, E.R., M.T. Moore, R. Kröger, C.M. Cooper and J.L. Farris. 2010. Vegetated agricultural drainage ditches and pesticide mitigation: A North American perspective. ArtWET Meeting, Mitigation of

agricultural nonpoint-source pesticide pollution and phytoremediation in artificial wetland ecosystems, Landau, Germany.

Grants -Farris

Kroger, R., Farris, JL, and Moore, MT Decreasing nitrate-N loads to coastal ecosystems with innovative drainage management strategies in agricultural landscapes, Mississippi Alabama Sea Grant Consortium (MASGC): \$143,800, 2/1/10- 1/31/12.

Farris JL, Center for Efficient and Sustainable Use of Resources (CESUR), Arkansas Science and Technology Authority (ASTA): \$ 100,000, 1/15/2010 – 1/14/12.

Farris, JL, Contaminant Removal by Edge-of-Field Wetlands, Specific Cooperative Agreement USDA No 58-6408-9-351: \$132,979.97, 1/1/2009-12/31/2013.

David Gilmore, Assistant Professor of Microbiology

Publications – Gilmore

- Pannkuk, E.L., D.F. Gilmore, B.J. Savary, and T.S. Risch. 2012. Triglyceride (TAG) profiles of integumentary lipids isolated from three bat species determined by matrix-associated laser desorption-ionization time-of-flight mass spectrometry (MALDI-TOF MS). *Can. J. Zool.* 90(9): 1117-1127.
- Hanning, I., D. Gilmore, S. Pendleton, S. Fleck, A. Clement, S.H. Park, E. Scott, and S.C. Ricke. 2012. Characterization of *Staphylococcus aureus* Isolates from Retail Chicken Carcasses and Pet Workers in Northwest Arkansas. *J. Food Prot.* 75(1): 174-178.

Presentations – Gilmore

1. 95th Annual Meeting of the Arkansas Academy of Sciences, Monticello, AR, April 8-9, 2011.
Gilmore, D. F. and X. Fu, "Antibiotic Resistance of *Staphylococci* Obtained from Pet Industry Employees".
2. 95th Annual Meeting of the Arkansas Academy of Sciences, Monticello, AR, April 8-9, 2011.
Jamison, J. and D. Gilmore, "The Use of Microbial Exopolysaccharides to Aid in the Reduction of Soil Erosion".
3. MidSouth SETAC Regional Chapter meeting, Jonesboro, AR, May 2011
Pannkuk, E.L., D. Gilmore, B. Savary, and T.S. Risch, "Application of matrix assisted laser desorption/ionization time-of-flight mass spectrometry for the analysis of bat integumentary biomolecules and *Geomyces* enzymes".
4. Southeastern Bat Diversity Network meeting, Louisville, MS, Feb. 2012
Pannkuk, E.L., D. Gilmore, B. Savary, and T.S. Risch, "Why would a fungus grow on a bat and how can we investigate the process?"
5. Midwest Bat Working Group meeting, Terra Haute, IN, April 2012
Pannkuk, E.L., D. Gilmore, B. Savary, and T.S. Risch, "Investigations into the host/pathogen ecology of the bat disease White-Nose Syndrome".
6. White-Nose Syndrome National Symposium, Madison, WI, June 4-7, 2012.
Pannkuk, E.L., D. Gilmore, B. Savary, and T.S. Risch, "White-Nose Syndrome: Pathogenicity of *Geomyces destructans* and the role of extracellular proteases in host/pathogen ecology".
7. 42nd Annual Symposium on Bat Research, San Juan, Puerto Rico, Oct. 24-27, 2012.
Pannkuk, E.L., N. Fuller, D. Gilmore, B. Savary, and T.S. Risch, "Lipid Profiles of bat integument: a comparison of glycerolipid contents among species and tissues.

Grants - Gilmore

1. "White-Nose Syndrome: Pathogenicity of *Geomyces destructans* and the Role of Secreted Extracellular Enzymes in Host/Pathogen Ecology", Arkansas State Wildlife grant, May 2012. Co-PI
2. "Prevalence and Characterization of Shiga toxin-producing *E. coli* (STEC) from Cattle Farms in the Arkansas Delta Region", USDA-NIFA, July 2011. Co-PI

Anne Grippo, Associate Professor of Biology

Publication – A. Grippo

- Kennon, JT, GL Vaughan IV, J Bouldin, AA Grippo. 2013. Simple toxicity testing utilizing *Daphnia* spp. and table salt. *Science Scope*. In press.
- Pearce, AR, AL Sale, M Srivatsan, CW Beck, LS Blumer, AA Grippo. 2013. Inquiry-based Investigation in Biology Laboratories: Does Neem Provide Bioprotection Against Bean Beetles? *Bioscene*. Accepted for publication.
- Brown, CE, S Trauth, RS Grippo, BJ Gurley, AA Grippo. 2012. Combined effects of ephedrine-containing dietary supplements, caffeine, and nicotine on morphology and ultrastructure of rat hearts. *J Caff Res*. 2(3):123-132.
- Shannon, J, J Shannon, S Modelevsky, AA Grippo. 2011. Bisphosphonates and osteonecrosis of the jaw. *Amer. J. Ger. Pharmacother. J Am Geriatr Soc* 59:2350–2355, 2011.

Presentations – A. Grippo

1. Kennon JT, JM Hall, JL Bouldin, K Yanowitz, BD Engelken, AA Grippo. Introducing Toxicity Testing to Mid-to High School Level Students: A Fun Teaching Activity Using *Daphnia*. Society of Environmental Toxicology & Chemistry International Conference (2012)
2. Yanowitz KL, AA Grippo, JM Hall, JT Kennon. Try out the Classroom: Creating STEM Teachers for Arkansas' Future. NSF Noyce Regional Conference (2012)
3. Grippo AA, JM Hall, JT Kennon, M Cobb. C-STAF: Creating STEM teachers for Arkansas' future. NSF Noyce National Conference (2012)
4. Bouldin JL, KL Yanowitz, CA Miller, AA Grippo, JT Kennon. Graduate fellows at Arkansas State University enhance science curriculum in the Arkansas Delta. NSF GK-12 National Conference (2012)
5. Guthrey C, R Parr, D Smith, L Devareddy, A Grippo. Effect of blueberry diet on inflammation in ovariectomized rats. Create@State Arkansas State University (2012)
6. Kennon JT, K Freeman-Nelson, M Trevathan, A Earhart, JM Hall, AA Grippo. A Fun Real-World Experiment Testing Different Sunscreens. Arkansas Curriculum Conference (2011)
7. Montalvo B, A McMickle, P Weathers, A Grippo. Antimalarial drug availability from artemisinin-enriched leaves from *Artemisia annua*. AR INBRE Research Conference (2011)
8. Guthrey C, R Parr, D Smith, L Devareddy, A Grippo. Effect of blueberry diet on inflammation in ovariectomized rats. AR INBRE Research Conference (2011)
9. Grippo A, JT Kennon, JM Hall, BD Engelken, K Yanowitz, J Bouldin. Creating STEM teachers for Arkansas' future by designing an environmental science outreach activity. Society of Environmental Toxicology & Chemistry Regional Conference (2011)
10. Bouldin JL, KL Yanowitz, CA Miller, AA Grippo, JT Kennon. Enhanced environmental education in middle school classrooms by graduate students in the Arkansas Delta. North American Benthological Society National Conference (2011)
11. A Lovelace, Pearce AR, M Srivatsan, A Grippo. Bioprotection from beetles: investigating the untapped secrets of the neem tree. Create@State Arkansas State University (2011)
12. Montalvo B, A McMickle, A Ryan, A Grippo. Rats as a model for testing the effects of Allura Red in canines. Create@State Arkansas State University (2011)

13. Bouldin JL, AA Grippo, JT Kennon, CA Miller, T Risch, M Hall. Land use, land cover, and biodiversity in the Mississippi embayment. NSF GK12 National Conference (2011)
14. Pearce AR, M Srivatsan, A Grippo, A Lovelace. Introducing inquiry-based investigation in biology laboratories: Does neem provide bioprotection against bean beetles? AAAS National Conference (2011)
15. Kennon JT, J Stewart, L Prince, JM Hall, AA Grippo. A fun environmental science experiment using water fleas. Arkansas Curriculum Conference (2010)
16. Bouldin JL, KL Yanowitz, CA Miller, AA Grippo, JT Kennon. Pedagogy by graduate students enhance communication skills and science education in the Arkansas Delta. Society of Environmental Toxicology & Chemistry International Conference (2010)
17. Grippo AA, JT Kennon, JM Hall, R Engelken, K Yanowitz, J Trautwein, J Bouldin, R Popejoy, T Fuller. C-STAF: Creating STEM teachers for Arkansas' future. NSF Noyce National Conference (2010)

Grants – A. Grippo

2011 AR Community Foundation (co-I/Pearce)

2009 NSF Noyce Scholarship (PI) (\$899,998) 2009-2014

Rich Grippo Professor of Environmental Biology

Publication – R. Grippo

Brown, CE, SE Trauth, RS Grippo, BJ Gurley, AA Grippo. 2012. Combined Effects of Ephedrine-Containing Dietary Supplements, Caffeine, and Nicotine on Morphology and Ultrastructure of Rat Hearts. J. Caffeine Res. In press.

Presentation – R. Grippo

- Macchia, E. T, Bednarz, J., Grippo, R., 2010. A predictive model for the loss of Neotropical migrants at communication towers in Arkansas. Joint annual meeting of the American Ornithologists' Union, Cooper Ornithologist Society, and the Society of Canadian Ornithologists, American Ornithologists' Union, Cooper Ornithologist Society, and the Society of Canadian Ornithologists, San Diego, (February 8, 2010).
- Grippo, R.S. 2010. Physiological and toxicological effects of SDS, an oil spill dispersant surrogate, on an eurihaline fish in simulated open ocean and estuarine environments. 31st Annual Meeting of the Society of Environmental Toxicology and Chemistry, Portland, OR.
- Grippo, R.S. 2011. Differential toxicity of an oil spill dispersant surrogate in simulated open ocean and estuarine environments. Annual meeting of the AR Chapter of the American Fisheries Society, Little Rock, AR, Feb. 2-4.
- Grippo, R.S. 2011. Oil in the Sea: Comparison of the *Exxon Valdez* spill (Alaska) and the Deepwater Horizon blow-out (Gulf of Mexico). Seminar Series in Aquaculture and Fisheries Sciences, University of Arkansas, Pine Bluff, AR February 25. **Invited talk.**
- Grippo, R.S. 2011. Comparison of 2005 and 2009 Jonesboro Municipal Solid Waste and Level of Recyclables going to the Legacy Landfill. "Recycling Beyond the Curb Workshop" Jonesboro Chamber of Commerce, July 12. **Invited talk.**
- Macchia, E.T., Bednarz, J., Grippo, R.S., Suarez, R.S. 2011. The influence of migration intensity and weather on avian fatalities at communication towers in Arkansas. 129th Stated Meeting of the American Ornithologists' Union, Jacksonville, FL.
- Grippo, R.S. 2011. The Gulf of Mexico Dead Zone: A Brief Overview. Arkansas Rivers Association, Jonesboro, AR **Invited talk.**
- Grippo, R.S., T. Risch, A. Gill, R. Johnson, J.K. Tilman. 2012. Informal Science Education: Fishing for STEM Literacy. Annual meeting of the AR Chapter of the American Fisheries Society, Conway, AR
- Macchia, E.T., J.C. Bednarz, and R.S. Grippo. 2012. The influence of communication tower attributes on migrating songbirds in Arkansas. Southeast Partners in Flight Annual Meeting, Raleigh, NC **Awarded Best Student Oral Presentation**
- Macchia, E.T., J.C. Bednarz, and R.S. Grippo. 2012. Does sampling underneath guy wires underestimate the loss of birds at communication towers? 5th North American Ornithological Conference, Vancouver, British Columbia, Canada.

Risch, T., A. Gill, R. Grippo, R. Johnson, and T. Kennon. 2012. National Science Foundation Informal Science Education Program Proposal: Fishing for STEM Literacy 31st Annual Meeting of the Society of Environmental Toxicology and Chemistry, Long Beach, CA.

Grants - R. Grippo

2010

Planning Grant for the Harp Environmental Field Station. National Science Foundation Field Station and Marine Laboratory Program. \$24,000 for three years. T. Risch (PI), R. Grippo (Co-PI).

John Harris, Adjunct Research Assistant Professor

Publications - Harris

- Peck, A., M. Wine, C. Liller, R. Looney, and J. Harris. 2010. Use of habitat credit trading as a mitigation tool for transportation projects: a Federal Highway Administration pilot project in Arkansas. In Proceedings of the 2009 International Conference on Ecology and Transportation, edited by Paul J. Wagner, Debra Nelson, and Eugene Murray. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University. Pages 207-220.
- Wentz, N. J., J. L. Harris, J. L. Farris, and A. D. Christian. 2010. Mussel inventory and population status of the federally endangered *Potamilus capax* (Green 1832) in the Tyronza River, Arkansas. *Journal of the Arkansas Academy of Science* 63:169-176.
- Matthews, M. W., F. Usrey, S. W. Hodges, J. L. Harris, and A. D. Christian. 2010. Species richness, distribution, and relative abundance of freshwater mussels (Bivalvia: Unionidae) of the Buffalo National River, Arkansas. *Journal of the Arkansas Academy of Science* 63:113-130.
- Martin, H. C., J. L. Harris, and A. D. Christian. 2010. A qualitative freshwater mussel survey of the South Fork Spring River, Missouri and Arkansas. *Journal of the Arkansas Academy of Science* 63:106-112.
- Harris, J. L., W. R. Posey II, C. L. Davidson, J. L. Farris, S. Rogers Oetker, J. N. Stoeckel, B. G. Crump, M. Scott Barnett, H. C. Martin, M. W. Matthews, J. H. Seagraves, N. J. Wentz, R. Winterringer, C. Osborne, and A. D. Christian. 2010. Unionoida (Mollusca: Margaritiferidae, Unionidae) in Arkansas, third status review. *Journal of the Arkansas Academy of Science* 63:50-86.

Presentations - Harris

- Harris, J.L., Mark R. Smith, Kevin R. Piggott, Andrew J. Peck, and Alan D. Christian. 2013. Unionid Assemblages in Two St. Francis River Drainage Ditches Before and After Channel Maintenance Cleanouts. Oral Presentation. 8th Biennial Symposium, Freshwater Mollusk Conservation Society, March 10-14, 2013, Guntersville State Park, Guntersville, Alabama.
- Chong, Jer Pin, John L. Harris, Kevin J. Roe. 2013. Using Molecular Data to Aid Delineation of Two Species in the Freshwater Mussel Genus *Cyprogenia* (Bivalvia: Unionidae). 8th Biennial Symposium, Freshwater Mollusk Conservation Society, March 10-14, 2013, Guntersville State Park, Guntersville, Alabama.

Ronald L. Johnson, Professor of Zoology

Publications - Johnson

- Chandarana, J, D. J. Reish, and R. L. Johnson. 2013. Genetic Structure of the Polychaete *Nereis grubei* in the Context of Current Patterns and Life History. *Marine Ecology Progress Series* 473:215-224.
- Lamothe, K., R. L. Allen, C. Cato, K. Winningham, C. Dennis, and R.L. Johnson. 2012. Shifting Genetic Composition of Largemouth Bass Populations in Dendritic Arms of Two Large Arkansas Reservoirs Through Stocking of Florida Largemouth Bass. *Southeastern Association of Fish and Wildlife Agencies* 66:82-87.
- R. L. Johnson, S.D. Henry and S.W. Barkley. 2010. Distribution and population characteristics of shadow bass in two Arkansas Ozark streams. *North American Journal of Fisheries Management* 30:1522-1528.
- M.R. Weston, R.L. Johnson and A.C. Christian. 2010. Niche partitioning of the sympatric yellowcheek darter *Etheostoma moorei* and rainbow darter *Etheostomacaceruleum* in the Little Red River, Arkansas. *American Midland Naturalist* 164:187-200.

Presentations - Johnson

- Risch, T., A. Gill, R. Grippo, R. Johnson, and T. Kennon. 2012. National Science Foundation Informal Science Education Program Proposal: Fishing for STEM Literacy 31st Annual Meeting of the Society of Environmental Toxicology and Chemistry, Long Beach, CA.
- Lamothe, K. and R.L. Johnson. Shifting Genetic Composition of Largemouth Bass Populations in Dendritic Arms of Two Large Arkansas Reservoirs Through Stocking of Florida Largemouth Bass. *Southeastern Association of Fish and Wildlife Agencies* October 10, 2012. Hot Springs, AR
- J. Richardson, M. Gadbury, C. Cato, R. Allen and R.L. Johnson. Levels of hybridization of largemouth and Florida bass in several Arkansas lakes. *Arkansas Academy of Sciences*, April 9, 2010, Little Rock, AR.

Grants - Johnson

- Arkansas Game & Fish Commission. Determination of incorporation of Florida bass (*Micropterus floridanus*) alleles in largemouth bass (*Micropterus salmoides*) populations of several Arkansas reservoirs using microsatellite analysis. 7/1/12- 6/30/13. \$11,000.
- Arkansas Game & Fish Commission. Determination of incorporation of Florida bass (*Micropterus floridanus*) alleles in largemouth bass (*Micropterus salmoides*) populations of several Arkansas reservoirs using microsatellite analysis. 7/1/11- 6/30/12. \$14,130.
- US Fish & Wildlife Society. Genetic Study of Asian Elephant (*Elephas maximus*) Herds in Eastern Himalayan Region. Co-PI. 05/10/2012- \$49,997.
- Arkansas Game and Fish Commission. Genetic analysis of Florida and largemouth basses of southern Arkansas lakes using microsatellites. 8/1/10-7/31/11. \$14,130.

Tracy Klotz, Instructor

Publications – Klotz

Sasse, D.B.; T.S. Risch, D.A. Saugey; M.J. Harvey, J.D. Wilhide, R.K. Redman, J.J. Jackson, T. Klotz, and P.R. Moore. New Records of the Small-footed bat (*Myotis leibii*) in Arkansas. In preparation. Journal of the Arkansas Academy of Science. *In review*.

Tumblison R., D.B. Sasse, M. E. Cartwright, S. C. Brandebura, and T. Klotz. The American Badger (*Taxidea taxus*) in Arkansas, With Emphasis on Expansion of its Range into Northeastern Arkansas. The Southwestern Naturalist 2012 57 (4), 467-471.

Klotz, T.L., and T. S. Risch. 2009. New county distribution record for the Seminole bat in Arkansas. Journal of the Arkansas Academy of Science 62: 190-191.

Presentations – Klotz

Risch, T.S. and T.L. Klotz. A Long-Term study of Temperature and Disturbance at Roosts Sites of the Ozark Big-eared Bat (*Corynorhinus townsendii ingens*). Symposium on Conservation and Management of Big-eared Bats in the Eastern United States. March 9-10, 2010. Athens, Georgia. (Abstract published).

Travis Marsico, Assistant Professor of Botany

Publications – Marsico

- Harris, K. M., M. B. Foard, and **T. D. Marsico**. Understanding floristic diversity through a database of Greene County specimens. *Journal of the Arkansas Academy of Science*.
- Stephens, F. A., A. M. Woodard, and **T. D. Marsico**. 2012. Comparison between eggsticks of two cactophagous moths, *Cactoblastis cactorum* and *Melitara prodenialis* (Lepidoptera: Pyralidae). *Florida Entomologist* 95(4): 939-943.
- Sauby, K. E., **T. D. Marsico**, G. N. Ervin, and C. P. Brooks. 2012. The role of host identity in determining the distribution of the invasive moth *Cactoblastis cactorum* (Lepidoptera: Pyralidae) in Florida. *Florida Entomologist* 95(3): 561-568.
- Woodard, A. M., G. N. Ervin, and **T. D. Marsico**. 2012. Host plant defense signaling in response to a coevolved herbivore combats introduced herbivore attack. *Ecology and Evolution* 2: 1056-1064. DOI: 10.1002/ece3.224.
- Stewart, J. M., **T. D. Marsico**, D. Burge, and J. J. Hellmann. 2012. Largest known *Quercus garryana* Douglas ex Hook. clone discovered on a steep slope at the boundary of Larrabee State Park, Washington, USA. *International Oaks* 23: 68-75.
- Schartel, T. E., **T. D. Marsico**, and C. P. Brooks. 2011. First records of the parasitoid *Temelucha sinuata* Cushman (Hymenoptera: Ichneumonidae) in Mississippi and Florida, U.S.A. *Entomological News* 122: 376-377.
- Marsico, T. D.**, L. E. Wallace, G. N. Ervin, C. P. Brooks, J. E. McClure, and M. E. Welch. 2011. Geographic patterns of genetic diversity from the native range of *Cactoblastis cactorum* (Berg) support the documented history of invasion and multiple introductions for invasive populations. *Biological Invasions* 13: 857-868. DOI: 10.1007/s10530-010-9874-9.
- Marsico, T. D.**, J. W. Burt, E. K. Espeland, G. W. Gilchrist, M. A. Jamieson, L. Lindström, G. K. Roderick, S. Swope, M. Szűcs, and N. D. Tsutsui. 2010. Underutilized resources for studying the evolution of invasive species during their introduction, establishment, and lag phases. *Evolutionary Applications* 3: 203-219.

Presentations –Marsico

- Marsico, T. D.**, M. P. Hardin, A. M. Woodard, and X. Huang. (Poster) Aligning two pyralid moth transcriptomes to the annotated silkworm genome. NSF Bioinformatics Workshop to Foster Collaborative Research, Little Rock, Arkansas (3-5 March 2013); 3rd Place Poster Award for Faculty/Staff in the Biological Division
- Marsico, T. D.**, and A. M. Woodard. Do recent invasion frameworks downplay the community context of species invasions? A case study using an invasive phytophagous insect. 97th Annual Meeting of the Ecological Society of America, Portland, Oregon (5-10 August 2012)
- Marsico, T.**, B. Bennett, M. Huss, and F. Medina-Bolivar. Recent advances in formal botanical education at Arkansas State University: an eye to the future. 3rd Annual Meeting of the American Council for Medicinally Active Plants, Jonesboro, Arkansas (22-25 May 2012)
- Harris, K. M., M. B. Foard, and **T. D. Marsico**. Understanding floristic diversity through a database of Greene County specimens. 96th Annual Arkansas Academy of Science Meeting, Southern Arkansas University, Magnolia, Arkansas (13-14 April 2012)

- Woodard, A. M., R. A. F. Warby, B. Rougeau, and **T. D. Marsico**. Identification of cactus-derived volatile organic compounds induced by cactus boring moth herbivory using SPME sampling and GC/IT-MS analysis. Joint Southeastern/Southwestern Branch Meeting, Entomological Society of America, Little Rock, Arkansas (4-7 March 2012)
- Marsico, T. D.**, A. M. Woodard, and G. N. Ervin. (Poster) Host plant defense signaling in response to a coevolved herbivore combats introduced herbivore attack. Gordon Research Conference: Plant Volatiles, Ventura, California (29 January-3 February 2012)
- Woodard, A., J. Hubstenberger, F. Medina-Bolivar, G. Phillips, and **T. D. Marsico**. (Poster) Biosynthesis of defense-priming volatiles from *Opuntia* associated with cactus boring moth (Lepidoptera: Pyralidae) herbivory. Gordon Research Conference: Plant Volatiles, Ventura, California (29 January-3 February 2012)
- Marsico, T. D.** (Invited Symposium speaker) Consequences of direct defenses induced by cactus-derived VOCs for the invasive cactus borer, *Cactoblastis cactorum* (Lepidoptera: Pyralidae). Entomology 2011, Reno, Nevada (13-16 November 2011)
- Woodard, A., J. Hubstenberger, F. Medina-Bolivar, G. Phillips, and **T. D. Marsico**. (Poster) Biosynthesis of defense-priming volatiles from *Opuntia* associated with cactus boring moth (Lepidoptera: Pyralidae) herbivory. Entomology 2011, Reno, Nevada (13-16 November 2011)
- Burge, D., **T. D. Marsico**, and B. Justus. (Poster) Arkansas wetland flora structure 2011. Natural Areas Conference, Tallahassee, Florida (1-4 November 2011)
- Marsico, T. D.** Plant recognition and defense against coevolved insect herbivores: insights from a pricklypear/cactus borer study system. Arkansas P3 Center Symposium, Heber Springs, Arkansas (26-28 July 2011)
- Woodard, A. M., G. N. Ervin, and **T. D. Marsico**. (Poster) Defense priming as a mechanism to combat newly-associated insect herbivores. Arkansas P3 Center Symposium, Heber Springs, Arkansas (26-28 July 2011); 3rd place award
- Woodard, A., G. Ervin, and **T. Marsico**. Defense priming as a mechanism to combat newly-associated insect herbivores. Botany 2011, Healing the Planet, St. Louis, Missouri (9-13 July 2011)
- Foard, M. and **T. Marsico**. (Poster) Chinese privet invasion decreases botanical species richness in a riparian forest. Botany 2011, Healing the Planet, St. Louis, Missouri (9-13 July 2011)
- Marsico, T. D.**, G. N. Ervin, and C. P. Brooks. (Poster) Putting hypothesized native-range phylogeographic patterns of *Cactoblastis cactorum* to the test using genetic and climatic data. International Biogeography Society 5th International Conference, Heraklio, Crete, Greece (7-11 January 2011)
- Marsico, T. D.**, A. M. Woodard, and G. N. Ervin. (Poster) Potential eavesdropping may cue inducible defenses against an invasive herbivore. Entomological Society of America Annual Conference, San Diego, CA (12-15 December 2010)
- Harris, K. M., M. B. Foard, and **T. D. Marsico**. (Poster) The Greene County vascular flora project. 2010 McNair Research Conference, University of Arkansas, Fayetteville, AR (4-5 November 2010)
- Marsico, T. D.** (Invited Faculty Presentation) Plant-plant signaling may cue inducible defenses against an invasive herbivore. Arkansas INBRE Research Conference, Fayetteville, AR (15-16 October 2010)

Marsico, T. D., A. M. Woodard, and G. N. Ervin. (Poster) Novel defenses in invasion resistance: potential eavesdropping may cue inducible defenses against an invasive herbivore. Arkansas P3 Center Symposium, Winthrop Rockefeller Institute, Petit Jean, AR (15-17 August 2010)

Perez, L. and **T. D. Marsico**. (Poster) Testing multiple mitochondrial and nuclear genes for utility in *Cactoblastis cactorum* phylogeographic research. Research Internships in Science of the Environment (RISE) Student Symposium, Arkansas State University, Jonesboro, AR (5 August 2010)

Stephens, F., A. Woodard, and **T. D. Marsico**. (Poster) Analysis for a field key for identification of cactophagous moth eggsticks. Research Internships in Science of the Environment (RISE) Student Symposium, Arkansas State University, Jonesboro, AR (5 August 2010)

Marsico, T. D., A. M. Woodard, and G. N. Ervin. Novel defenses in invasion resistance: potential eavesdropping may cue inducible defenses against an invasive herbivore. 95th Ecological Society of America Annual Meeting, Pittsburgh, Pennsylvania (1-6 August 2010)

Woodard, A. M., **T. D. Marsico**, and G. N. Ervin. (Poster) Evaluating differential defense response in two native cactus species. Biological Undergraduate Research Program Symposium, Mississippi State University, Starkville, Mississippi (16 April 2010)

Marsico, T. D., G. N. Ervin, C. P. Brooks, B. A. Counterman, L. E. Wallace, and M. E. Welch. (Poster) Using next-generation sequencing approaches to investigate reciprocal recognition and response in plant-herbivore interactions. 7th Annual MidSouth Computational Biology and Bioinformatics Society (MCBIOS) Conference, Arkansas State University, Jonesboro, Arkansas (19-20 February 2010)

Grants –Marsico

- Determining Influences of Stream Channelization and an Invasive Species on Rate of Canopy Tree Growth in an Urban Park (January 2013-January 2014); Tree Fund, Jack Kimmel International Grant Program; \$6,284; PI
- Selection of Hairy Root Cultures to Optimize Production of Plant Defense Compounds (July 2012-June 2013); Arkansas State University Faculty Research Award; \$8,733; PI
- The Experiential Learning Fellowship (ELF) Program (August 2011-July 2016); NSF; \$567,185; PI
- Mechanisms and impacts of Chinese privet invasion in the Southeast United States (July 2011-June 2012); Judd Hill Foundation; \$5,560; PI
- Identification of Biological Methods for Evaluating Wetland Water Quality Conditions in Arkansas (May 2011-September 2013); United States Environmental Protection Agency; \$317,661; Co-PI
- Crowley's Ridge Botanical Inventory (April 2010-May 2011); Arkansas Natural Heritage Commission; \$20,000; PI
- Botanical Inventory of Shelby Farms Park Conservancy (July 2010-May 2011); subcontract from the University of Memphis; \$5,000
- The Phylogeography of *Cactoblastis cactorum* in its Native Argentina as a Baseline for Predicting Local Adaptation and Species Invasion (July 2010-June 2011); Arkansas State University Faculty Research Award; \$3,860; PI
- Arkansas Biosciences Institute Faculty Grant (January 2010-June 2010); Arkansas State University; \$30,000; PI

Fabricio Medina-Bolivar, Associate Professor of Plant Metabolic Engineering

Publications –Medina-Bolivar

- Condori J, Sivakumar S, Hubstenberger J, Dolan MC, Sobolev VS, **Medina-Bolivar F**. 2010. Induced biosynthesis of resveratrol and the prenylated stilbenoids arachidin-1 and arachidin-3 in hairy root cultures of peanut: Effects of culture medium and growth stage. *Plant Physiology and Biochemistry*. 48:310-318.
- Abbott J, **Medina-Bolivar F**, Martin E, Engelberth AS, Villagarcia H, Clausen EC, Carrier DC. 2010. Purification of resveratrol, arachidin-1 and arachidin-3 from hairy root culture of peanut (*Arachis hypogaea*) and determination of their antioxidant activity and cytotoxicity. *Biotechnology Progress*. 26(5):1344-1351
- Medina-Bolivar F**, Condori J, Nopo-Olazabal C, Carrier J, Abbott J, Nair V, Atwill R, Baker J, Nopo-Olazabal L, Dolan M. 2010. Controlled production of stilbenoids in hairy root cultures of peanut (*Arachis hypogaea*). *Phenols Communications*. 1: 42-43.
- Joshee N, Parajuli P, **Medina-Bolivar F**, Rimando AM, Yadav AK. 2010. *Scutellaria* biotechnology: achievements and future prospects. *Bulletin UASVM Horticulture*. 67(1)/2010.
- Sivakumar G, **Medina-Bolivar F**, Lay J, Dolan MC, Condori J, Wright SM, Baque MDA, Lee E-J, Paek KY. 2011. Bioprocess and bioreactor: Next generation technology for production of potential plant-based antidiabetic and antioxidant molecules. *Current Medicinal Chemistry*. 18:79-90.
- Condori J, Nopo-Olazabal C, Medrano G, **Medina-Bolivar F**. 2011. Selection of reference genes for qPCR in hairy roots cultures of peanut. *BMC Research Notes*. 4:392
- Luis Nopo, Woffenden B, Reed D, Buswell S, Zhang C, **Medina-Bolivar F**. 2012. Super-promoter: TEV, a powerful gene expression system for tobacco hairy roots. (In: *Recombinant Gene Expression: Reviews and Protocols*, Third Edition, A. Lorence (Ed.), Springer). *Methods in Molecular Biology*. 824:501-526.
- Brents LK, **Medina-Bolivar F (*)**, Seely KA, Nair V, Bratton SM, Gallus-Zawada A, Nopo-Olazabal L, Patel RY, Liu H, Doerksen RJ, Prather P, Radominska-Pandya A. 2012. Natural prenylated resveratrol analogs, arachidin-1 and -3, demonstrate an improved glucuronidation profile and have affinity for cannabinoid receptors. *Xenobiotica*. 42:139-156. [***First two authors share first authorship**]
- Joshee N, Tascan A, **Medina-Bolivar F**, Parajuli P, Rimando AM, Shannon DA, Adelberg JW. 2013. *Scutellaria*: Biotechnology, Phytochemistry and its Potential as a Commercial Medicinal Crop. In: *Biotechnology for Medicinal Plants: Micropropagation and Improvement*, Eds. Suman Chandra, Hemant Lata and Ajit Varma, Springer-Verlag, Heidelberg Germany. pp. 69-99.
- Prabhu P, **Medina-Bolivar F**, Condori J, Sivakumar G, Srivatsan M. Neuroprotective effect of peanut hairy root extract (PHRE) against oxidative stress in PC12 derived neurons. *Journal of Medicinally Active Plants (in press)*.

Presentations – Medina-Bolivar

2010

- Condori J, Nopo-Olazabal C, **Medina-Bolivar F**. 2010. Bioinformatic tools for cloning and characterizing the stilbenoid pathway in peanut and muscadine grape. 7th Annual Conference of the MidSouth Computational Biology and Bioinformatics Society (MCBIOS). Jonesboro, AR. February 19-20. (poster).
- Sivakumar G, **Medina-Bolivar F**, Lay JO. 2010. Natural coronosolic acid: Future phytoinsulin? CHI 17th International Molecular Medicine Tri-Conference. San Francisco, CA. February (poster)

- Medina-Bolivar, F.** Resveratrol: Harvesting healthy chemicals from hairy roots. 2010. Dept. of Biochemistry. University of Arkansas for Medical Sciences. Little Rock, AR. March 10, 2010. (Invited speaker).
- Anna Radomska-Pandya A, Nair V, Bratton SM, Gallus-Zawada A, Prather PL, **Medina-Bolivar F.** 2010. Human UDP-glucuronosyltransferases (UGTs) are involved in the metabolism of the natural resveratrol analogues arachidin-1, arachidin-3 and piceatannol. Experimental Biology Meeting. Anaheim, CA. April 2010. (poster).
- Greenway M, **Medina-Bolivar F**, Dolan M, Nopo-Olazabal L, Phillips IC, Lloyd MN, Hubstenberger J, Phillips GC. 2010. Characterization of hairy root cultures and elicitation of coumaric acid in raspberry, *Rubus idaeus*. 2010. Society for In Vitro Biology Congress. St. Louis, MO. June 6-11 (poster).
- Medina-Bolivar F**, Condori J, Nopo-Olazabal C, Nopo-Olazabal L, Baker J, Atwill R, Abbot J, Dolan M, Carrier J, Sivakumar G, Nair V, Hubstenberger J. 2010. Distinct biosynthesis of resveratrol analogues in hairy root cultures of peanut and muscadine grape. 12th International Association for Plant Biotechnology Congress. St. Louis, MO. June 6-11 (invited talk).
- Nopo-Olazabal L, Wu S, Rimando A, Joshee N, **Medina-Bolivar F.** 2010. Production of antitumor flavonoids in hairy roots of *Scutellaria lateriflora*. 1st Annual Conference of the American Council for Medicinally Active Plants. New Brunswick, NJ. July 20-23 (talk)
- Nopo-Olazabal C, Villagarcia H, Khodakovskaya M, **Medina-Bolivar F.** 2010. Manipulation of secondary metabolism in hairy roots of tomato transformed with a mammalian polyphosphate 5-phosphatase. 1st Annual Conference of the American Council for Medicinally Active Plants. New Brunswick, NJ. July 20-23 (poster)
- Condori J, Nopo-Olazabal C, Atwill R, Baker J Nopo-Olazabal L, **Medina-Bolivar F.** 2010. Comparison of sodium acetate- and methyl jasmonate-mediated elicitation of bioactive stilbenoids in hairy root cultures of peanut. 1st Annual Conference of the American Council for Medicinally Active Plants. New Brunswick, NJ. July 20-23 (poster; 1st Place Poster Award Competition by J. Condori)
- Medina-Bolivar F**, Condori J, Carrier J, Srivatsan M, Radomska-Pandya A, Sivakumar G, Nair V, Dolan M. 2010. Natural resveratrol analogs from root cultures of peanut and muscadine grape: bioproduction, biotransformation and bioactivity. 1st Annual Conference of the American Council for Medicinally Active Plants. New Brunswick, NJ. July 20-23 (invited talk)
- Condori J, Atwill R, Nopo-Olazabal L, **Medina-Bolivar F.** 2010. Cyclodextrin regulates stilbenoid biosynthesis leading to high levels of resveratrol and its prenylated analogs in hairy root cultures of peanut. Plant Powered-Production-P3 Symposium. Morrilton, AR. August 15-17. (poster)
- Medina-Bolivar F**, Condori J, Nopo-Olazabal C, Nopo-Olazabal L, Dolan M, Carrier DJ, Srivatsan M, Sivakumar G, Nair V, Hubstenberger J. 2010. Biosynthesis of monomeric and oligomeric stilbenoids in hairy root cultures of peanut and muscadine grape. International Conference on Polyphenols. Montpellier, FRANCE. August 24-27. (talk).
- Prather P, Cortez L, Nopo-Olazabal L, Nair V, **Medina-Bolivar F**, Radomska-Pandya A. 2010. Natural resveratrol analogs arachidin-1, arachidin-3 and piceatannol bind human and mice cannabinoid receptors CB1 and CB2. 9th International Society for the Study of Xenobiotics. 2010. Istanbul, TURKEY. September 4-8. (poster)
- Medina-Bolivar F**, Condori J, Nopo-Olazabal L, Nopo-Olazabal C, Carrier J, Srivatsan M, Sivakumar G, Dolan M. 2010. Natural prenylated resveratrol analogues from root cultures: Induced biosynthesis, purification and biological activity. 1st International Conference of Resveratrol and Health. Helsingor, DENMARK. September 13-16. (poster)

- Medina-Bolivar F**, Condori J, Atwill RL, Nopo C, Nopo L, Carrier DJ, Srivatsan M, Nair V, Sivakumar G, Dolan M. 2010. Bioproduction of bioactive prenylated resveratrol analogs in root cultures. ABI Fall Research Symposium. Little Rock, AR. September 29. (poster)
- Gilbert K, Blossom SJ, Gomez-Acevedo H, Cooney C, Plumford N, **Medina-Bolivar F**, Lorence A. 2010. Environmental pollutants as triggers of autoimmune disease: Collaborative research into mechanism of action and remediation. ABI Fall Research Symposium. Little Rock, AR. September 29. (talk)
- Joshee N, Parajuli P, Rimando AM, **Medina-Bolivar F**, Yadav AK. 2010. Scutellaria biotechnology: Achievements and future prospects. 9th International Symposium "Prospects for the 3rd Millennium Agriculture. Cluj Napoca, ROMANIA, September 30-October 2. (talk)
- Condori J, Atwill RL, Nopo-Olazabal L, **Medina-Bolivar F**. 2010. Effect of cyclodextrin on production of resveratrol and its prenylated analogs in hairy root cultures of peanut. Arkansas NSF EPSCoR Project Annual Conference. Little Rock, AR, October 4-5. (poster)
- Condori J, Nopo-Olazabal C, Atwill RL, **Medina-Bolivar F**. 2010. Reference gene selection for qPCR in hairy root cultures of peanut. qPCR and Data Mining Symposium, San Francisco, CA, November 1-5. (poster; *2nd Place Poster Award Competition by J. Condori*)
- Medina-Bolivar F**. 2010. Harvesting healthy chemicals from hairy roots. St. Jude Children's Research Hospital. Memphis, TN, November 1. (invited talk)

2011

- Medina-Bolivar F**. 2011. Hairy root cultures of *Veratrum californicum* for the production of cyclopamine and related steroidal alkaloids. Veratrum Summit. Park City, UT, June 28-30. (invited talk)
- Balmaceda C, Atwill RL, Nopo-Olazabal L, Marsh Z, **Medina-Bolivar F**. 2011. Synergistic effect of cyclodextrin and methyl jasmonate on production of resveratrol and its prenylated analogues arachidin-1 and arachidin-3 in hairy root cultures of peanut. 2nd Annual Conference of the American Council for Medicinally Active Plants. July 17-20. (poster: *1st Place Poster Award Competition by C. Balmaceda*)
- Nopo-Olazabal C, Nopo-Olazabal L, Condori J, Patel A, Hubstenberger J, **Medina-Bolivar F**. 2011. Differential elicitation of stilbenoids in hairy root cultures of muscadine grape and peanut. 2nd Annual Conference of the American Council for Medicinally Active Plants. July 17-20. (invited talk)
- Zhai B, Rivas F, Clark J, Ferrand MI, Nopo L, **Medina-Bolivar F**. 2011. Characterization of methyl-jasmonate inducible metabolites in hairy root cultures of annatto (*Bixa orellana*): Towards the identification of novel antimalarial phytochemicals. Arkansas P3 Symposium. Heber Springs, AR. July 26-28. (poster)
- Atwill RL, Nopo L, **Medina-Bolivar F**. 2011. Production of resveratrol and its prenylated analogs in 1 liter hairy root cultures of peanut and their purification by high performance counter current chromatography. Arkansas P3 Symposium. Heber Springs, AR. July 26-28. (poster)
- Condori J, **Medina-Bolivar F**. 2011. Identification and characterization of a stilbene synthase gene family in peanut hairy roots. Arkansas P3 Symposium. Heber Springs, AR. July 26-28. (poster)
- Joshee N, Parajuli P, Rimando A, **Medina-Bolivar F**. 2011. *Scutellaria ocmulgee* small: An endangered plant with limited distribution but unlimited potentials. 23rd Annual Meeting of the Association for the

Advancement of Industrial Crops (AAIC): Challenges and Opportunities for Industrial Crops), Fargo, ND. September 11-14. (invited talk).

Atwill RL, Balmaceda C, Nopo L, Condori J, **Medina-Bolivar F**. 2011. Bioproduction and purification of arachidin-1 and arachidin-3 by high performance counter current chromatography from hairy root cultures of peanut. Arkansas Biosciences Institute Fall Research Symposium. Little Rock, AR. September 21. (poster)

Woodard, A., Hubstenberger J, **Medina-Bolivar F**, Phillips G, Marsico T. 2011. Biosynthesis of defense-priming volatiles from *Opuntia* associated with cactus boring moth (Lepidoptera: Pyralidae) herbivory. 59th Annual Meeting of the Entomological Society of North America, Reno, NV. November 13-16. (poster).

2012

Woodard, A., Hubstenberger J, **Medina-Bolivar F**, Phillips G, Marsico T. 2012. Biosynthesis of defense-priming volatiles from *Opuntia* associated with cactus boring moth (Lepidoptera: Pyralidae) herbivory. Plant Volatiles Gordon Research Conference. Ventura, CA. January 29-February 3. (poster)

Marsh Z, Nopo-Olazabal L, Joshee N, **Medina-Bolivar F**. 2012. Production of specialized metabolites in hairy root cultures of *Scutellaria lateriflora* treated with cyclodextrin and methyl jasmonate. Create @ State. Jonesboro, AR. April 5. (poster)

Atwill R, Nopo-Olazabal L, **Medina-Bolivar F**. 2012. Purification of the prenylated resveratrol analogs arachidin-1 and arachidin-3 from hairy root cultures of peanut by high performance counter current chromatography. Create @ State. Jonesboro, AR. April 5. (poster)

Zhai B, Rivas F, Connelly M, Clark J, Ferrand MI, Nopo L, **Medina-Bolivar F**. 2012. Antimalarial evaluation of hairy root cultures of *Bixa orellana*. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)

Bratton SM, Dates C, Nair V, Nopo-Olazabal L, Francisdevaraj F, **Medina-Bolivar F**, Radominska-Pandya A. 2012. Natural prenylated resveratrol analogs arachidin-1 and arachidin-3: Altered glucuronidation could lead to enhanced bioavailability. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster).

Marsh Z, Nopo-Olazabal L, Yang T, Joshee N, **Medina-Bolivar F**. Elicitation and secretion of specialized metabolites in *Scutellaria lateriflora* hairy root cultures treated with cyclodextrin and methyl jasmonate. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)

Nopo-Olazabal C, Nopo-Olazabal L, Hubstenberger J, **Medina-Bolivar F**. 2012. Induction of stilbenoids in hairy root cultures of peanut and muscadine grape treated with methyl jasmonate and hydrogen peroxide and determination of the antioxidant capacity of selected stilbenoids by the ABTS assay. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)

Nopo-Olazabal C, Khodakovskaya M, **Medina-Bolivar F**. 2012. Expression of a mammalian polyphosphate 5-phosphatase in tomato hairy roots affects root growth and antioxidant levels. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)

Yang T, Joshee N, Martin C, **Medina-Bolivar F**. 2012. Metabolic engineering of flavonoid biosynthesis in *Scutellaria lateriflora* hairy roots by ectopic expression of the AtMYB12 transcription factor. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)

- Marsico T, Bennet B, Huss M, **Medina-Bolivar F**. 2012. Recent advances in formal botanical education at Arkansas State University: An eye to the future. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)
- Zhang N, **Medina-Bolivar F**, Xu J. 2012. Plant hairy roots as a unique platform to study plant hydroxyproline-O-glycosylation process. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (poster)
- Medina-Bolivar F**, Balmaceda C, Atwill R, Yang T, Marsh Z, Nopo-Olazabal C, Nopo-Olazabal C, Joshee N. 2012. Root cultures as bioproduction systems of health-beneficial compounds. 3rd Annual Conference of the American Council for Medicinally Active Plants. Jonesboro, AR. May 22-25. (invited talk)
- Parr R, Ball J, Nopo-Olazabal L, Atwill RL, Ghai P, **Medina-Bolivar F**. 2012. Inhibition of rotavirus infection in a human intestinal cell line by specialized metabolites of peanut hairy root cultures. 31st Annual Meeting of the American Society of Virology. Madison, WI. July 21-25. (poster)
- Marsh Z, Nopo-Olazabal L, Yang T, Joshee N, **Medina-Bolivar F**. 2012. Induction of specialized metabolites in hairy roots of *Scutellaria lateriflora* treated with cyclodextrin and methyl jasmonate. International Congress on Natural Products Research. New York, NY. July 29-August 1. (poster)
- Atwill R, Nopo-Olazabal L, **Medina-Bolivar F**. 2012. Bioproduction and purification of prenylated resveratrol analogs from hairy root cultures of peanut. International Congress on Natural Products Research. New York, NY. July 29-August 1. (poster)
- Marsh Z, Nopo-Olazabal L, Yang T, Joshee J, **Medina-Bolivar F**. 2012. Effect of methyl jasmonate and cyclodextrin on production of specialized metabolites in hairy root cultures of *Scutellaria lateriflora* 2012 Arkansas EPSCoR Annual meeting, Springdale, AR. August 13-14. (poster)
- Nopo-Olazabal C, Nopo-Olazabal L, Condori J, Hubstenberger J, **Medina-Bolivar F**. 2012. Bioproduction of stilbenoids in hairy root cultures of peanut: Induced gene expression and antioxidant activity. 2012 Arkansas EPSCoR Annual meeting, Springdale, AR. August 13-14. (poster)
- Medina-Bolivar F**, Balmaceda C, Atwill R, Yang T, Marsch Z, Nopo-Olazabal C, Nopo-Olazabal L, Joshee N. 2012. Elicitation and metabolic engineering strategies to increase the levels of health-related polyphenols in root cultures. 244th American Chemical Society National Meeting. Philadelphia, PA. August 19-23. (invited talk)
- Greer AK, Bratton SM, Vo D, Ostojic N, Pyrek S, Francisdevaraj F, **Medina-Bolivar F**, Haun R, Radomska-Pandya A. 2012. Human UDP-Glucuronosyltransferases: Role in modulation of pancreatic cancer cell proliferation and drug toxicity. 18th North American Regional International Society for the Study of Xenobiotics (ISSX) Meeting. Dallas, TX. October 14-18. (poster)
- Dates C., Yao-Borengasser A, Bratton SM, Pyrek S, Bernock LJ, **Medina-Bolivar F**, Kadlubar S, Borrelli MJ, Mackenzie P, Radomska-Pandya A. 2012. Human UDP-Glucuronosyltransferases: Role in modulation of breast cancer cell proliferation and drug toxicity. 18th North American Regional International Society for the Study of Xenobiotics (ISSX) Meeting. Dallas, TX. October 14-18. (poster)
- Yang T, Marsh Z, Nopo-Olazabal L, Joshee N, **Medina-Bolivar F**. 2012. Metabolic engineering and elicitation strategies to manipulate the levels of bioactive flavonoids in hairy roots of *Scutellaria lateriflora*. Arkansas Biosciences Institute Fall Research Symposium. Fayetteville, AR. October 23. (poster)
- Zhang N, **Medina-Bolivar F**, Savary B, Xu J. 2012. Plant hairy roots as a unique platform to study plant hydroxyproline-O-glycosylation process. Arkansas Biosciences Institute Fall Research Symposium. Fayetteville, AR. October 23. (poster)

- Medina-Bolivar F.** 2012. "Hairy roots a source of unique medicinal compounds". University of Arkansas for Medical Sciences. Little Rock, Arkansas. November 9. (invited seminar)
- Medina-Bolivar F.** 2012. "Harvesting a healthy future from hairy roots". John Innes Centre. Norwich, United Kingdom. December 3. (invited lecture)
- Medina-Bolivar F**, Radomska-Pandya A, Atwill, Nopo-Olazabal C, Srivatsan M, Nopo-Olazabal L, Prather P, Doerksen R. 2012. Bioproduction and biological activity of the natural prenylated resveratrol analogs arachidin-1 and arachidin-3. 2nd International Conference of Resveratrol and Health. Leicester, United Kingdom. December 5-7. (poster).

2013

- Medina-Bolivar F.** 2013. Elicitation and metabolic engineering strategies to increase the levels of bioactive compounds in hairy root cultures. Southern Illinois University. Carbondale, IL. March 7. (invited seminar).
- Marsh Z, Yang T, Nopo-Olazabal L, Joshee J, **Medina-Bolivar F.** 2013. Bioproduction of bioactive flavonoids in hairy roots of *Scutellaria lateriflora*. Southern Regional Honors Council Conference. Louisville, KY. April 4-6. (poster)
- Patel A, Chang Y-K, Nopo-Olazabal C, Yang T, Ogutu L, Condori J, Nopo-Olazabal L, **Medina-Bolivar F.** 2013. Constitutive expression of resveratrol synthase and its effect on the biosynthesis of stilbenoids in hairy root cultures of peanut (*Arachis hypogea*). Annual Meeting of the American Society of Plant Biology – Southern Section. Little Rock, AR. April 6-8. (poster)
- Tollett CA, Ogutu L, Chang Y-K, Nopo-Olazabal L, **Medina-Bolivar F.** 2013. Biotransformation of piceatannol to its prenylated analog arachidin-1 in hairy roots cultures of peanut. Annual Meeting of the American Society of Plant Biology – Southern Section. Little Rock, AR. April 6-8. (poster)
- Yang T, Joshee N, Medina-Bolivar F. 2013. Regulation of flavone biosynthesis by expression of the AtMYB12 transcription factor in *Scutellaria lateriflora* hairy roots. Annual Meeting of the American Society of Plant Biology – Southern Section. Little Rock, AR. April 6-8. (talk)
- Ogutu L, Nopo-Olazabal L, Srivatsan M, **Medina-Bolivar F.** 2013. Biosynthesis enhancement and neuroprotective activity of stilbenoids from hairy root cultures of peanut. 245th American Chemical Society National Meeting & Exposition. New Orleans, LA. April 7-11. (invited talk by Linda Ogutu).
- Medina-Bolivar F. 2013. Biotechnological approaches to increase the levels of bioactive stilbenoids and flavonoids in hairy root cultures. Arkansas Center for Plant Powered Production-P3 Annual Meeting. Little Rock, AR. April 9. (invited talk)
- Marsh Z, **Medina-Bolivar F.** 2013. Secondary metabolite enhancement in hairy root cultures of *Scutellaria lateriflora* by treatment with cyclodextrin and methyl jasmonate. Create@Astate. Jonesboro, AR. April 11. (talk by Zachary Marsh)

Patents – Medina-Bolivar

- Medina-Bolivar F**, Dolan M, Bennett S, Condori J, Hubstenberger J.
 "Production of stilbenes in hairy roots".
 US Patent No. 7666677 (Issued 2010)

Radomska-Pandya F, Prather P, **Medina-Bolivar F**, Mayeux P.

“Stilbenoid derivatives and their uses.

US Provisional Patent Application No. 61427614 (filed December 28, 2010).

US Patent Application No. 13/339,163 (filed December 28, 2011).

Medina-Bolivar F, Yang T. “Method to increase the yield of products in plant material”.

US Provisional Patent Application No. 61729659 (filed November 26, 2012).

US Patent Application No. 13784877 (filed on March 5, 2013).

Grants – Medina-Bolivar

Nirmal J (Fort Valley State Univ.), Prahlad P (Karmanos Cancer Inst. at Wayne State Univ.), **Medina-Bolivar F** (Co-PI, ASU), Shannon D. (Auburn Univ.), Ellis B. (USDA), Rimando A (USDA)

“*Scutellaria* as a medicinal crop: Cryopreservation, hairy root culture, organic farming and anticancer activity”

United States Department of Agriculture (USDA), Cooperative State Research, Education and Extension Service (CSREES), 1890 Capacity Building Grant, National Competitive Proposal

\$ 434,258

10/01/08-09/30/11

Gilbert K, Lorence A, **Medina-Bolivar F** (Co-PI), Cramer C.

Phytoremediation of trichloroethylene

Arkansas Children’s Hospital Research Institute

\$ 180,000

07/01/08-06/30/10

Khodakovskaya M (PI, UALR), **Medina-Bolivar F** (Co-PI, ASU).

“Enhancing abiotic stress tolerance and production of antioxidant in plants for Advanced Life Support in Space Exploration”.

Arkansas Space Grant Consortium

\$ 45,000

04/15/08-4/14/11

Khodakovskaya M (PI, UALR), Grace S (Co-PI, UALR), Ali N (Co-PI, UALR), **Medina-Bolivar F** (Co-PI, ASU).

“Regulation of secondary metabolism in tomato by genetic manipulation of the phosphoinositol pathway”.

NSF-EPSCoR P3

\$ 149,928

04/01/09-3/31/10

Hannigan R (PI), Buchanan R (Co-PI), Cramer C (Mentor), Dolan M (Mentor), Bouldin J (Mentor), Christian A (Mentor), Lorence A. (Mentor), **Medina-Bolivar F** (Mentor), Anh S (Mentor), Green S (Mentor), Dowling C (Mentor), Phillips G (Mentor), Young N (Mentor)

“Undergraduate Research and Mentoring in the Biological Sciences: Cross-disciplinary Research at the Intersection of Biotechnology and the Environment”

National Science Foundation

\$ 1,112,685

01/15/08-12/15/13

Note: Dr. Medina-Bolivar was in charge of writing the Metabolite Identification section; Project 4, subproject 1 (“Development of chemical markers for black cohosh”)

Cramer C (PI), Thompson G, Korth K

Note: This proposal includes 21 scientists. Dr. F. Medina-Bolivar was involved in writing Objective II/Project 2 (“Manipulating of the terpenoid pathway for discovery and bioproduction of valuable phytochemicals in hairy

roots”) and Objective III/Objective 2/Aim 2 (“Elicitation as a gene discovery tool for master regulators of terpenoid biosynthesis in hairy roots”).

“Arkansas ASSET Initiative” – Plant Bioproduction Project

National Science Foundation EPSCoR Research Infrastructure Improvement Program

\$ 9,000,000

05/01/07-04/30/10

Medina-Bolivar F (PI)

“Root cultures of *Veratrum californicum* as a sustainable source of cyclopamine and related steroidal alkaloids”

– Feasibility Study

Infinity Pharmaceuticals

3/13/11-3/13/12

\$ 72,271

Medina-Bolivar F (PI)

“Root cultures of *Veratrum californicum* as a sustainable source of cyclopamine and related steroidal alkaloids”

Infinity Pharmaceuticals

3/13/12-3/13/13

\$ 215,659

Nirmal J (Fort Valley State Univ.), Prahlad P (Karmanos Cancer Inst. at Wayne State Univ.), **Medina-Bolivar F** (Co-PI, ASU), Ellis D. (USDA), Rimando A (USDA-ARS)

“Germplasm conservation, anti-adipocytic and anticancer activity, and metabolic engineering in the genus *Scutellaria*”

United States Department of Agriculture (USDA), Cooperative State Research, Education and Extension Service (CSREES), 1890 Capacity Building Grant, National Competitive Proposal

\$ 455,589

09/01/11-08/31/14

Atwill R (student), **Medina-Bolivar F** (PI; advisor)

“Production of resveratrol and its prenylated analogs in 1 liter peanut hairy root cultures and their purification using high performance counter current chromatography”.

Arkansas Department of Higher Education; Student Undergraduate Research Fund (SURF)

\$ 2,750

01/01/12-04/30/12

Marsh Z (student), **Medina-Bolivar F** (PI; advisor)

“Development of root cultures of *Veratrum californicum* for sustainable production of the antitumor alkaloid cyclopamine”

Arkansas Department of Higher Education; Student Undergraduate Research Fund (SURF)

\$ 4,000

01/01/12-12/31/12

Ogutu L (student). **Medina-Bolivar F** (PI; advisor)

“Biosynthesis enhancement and neuroprotective activity of stilbenoids from hairy root cultures of peanut”

Arkansas State University; Student Undergraduate Research Fund (SURF)

\$ 2,750

01/01/13-04/30/13

Tanja McKay, Associate Professor of Entomology

Publications – McKay

- McKay, T.**, K. Yanowitz, A. Ross and S. Vanderpool. Don't swat that fly! Using house flies in the inquiry classroom. *Science Scope* (In Press).
- Brown, H., L. Harrington, P. E. Kaufman, **T. McKay**, D. D. Bowman, C. T. Nelson, D. Wang and R. Lund. 2012. Key factors influencing canine heartworm, *Dirofilaria immitis*, in the United States. *Parasites & Vectors* 5:245.
- Gaspar*, J., **T. McKay** and M. Huss. 2012. First report of *Aedes japonicus* in natural and artificial habitats in northeast Arkansas. *Journal of the American Mosquito Control Association* 28: 38-42.
- Fiene*, J. G., M. B. Connior*, R. Androw, B. Baldwin and **T. McKay**. 2011. Surveys of Arkansas dung beetles (Coleoptera: Scarabaeidae and Geotrupidae): Phenologies, mass occurrences, state and distributional records. *American Midland Naturalist* 165: 319-337.
- Yanowitz, K., **T. McKay**, C. A. Ross, S. Vanderpool. 2011. CSI: Creating student (and teacher) investigators: Using popular culture in professional development. *Journal of Technology and Teacher Education* 18(2): 263-283.

Presentations – McKay

- *McKay, T. Potential Mosquito Vectors of Heartworm, *Dirofilaria immitis*, in Arkansas. *North American Veterinary Conference*. Orlando, FL. 22 January 2013
- *McKay, T*. An integrated flea control program in an Arkansas horse facility: A case study. *North American Veterinary Conference*. Orlando, FL. 22 January 2013
- *McKay, T. Teaching inquiry-based entomological lessons to high school teachers and students. *The 60th Annual Meeting of the Entomological Society of America*. 14 November 2012
- ***McKay, T.** An integrated flea control program in an Arkansas horse facility: A case study. Novartis Animal Health – Recharge Retreat for Veterinarians. Charlotte NC, Pittsboro, NC, Irving VA. May 2012
- ‡Gaspar, J., **T. McKay** and M. Huss. Trichomycete fungi associated with mosquito larvae in northeastern Arkansas. *88th Kansas (Central States) Entomological Society Annual Meeting*. 7 April 2012
- ‡Hampton, R., ‡J. Gaspar, T. McKay and M. Huss. Behavioral and developmental effects of trichomycete fungi (*Smittium culis*) on Culicidae (*Culex pipiens*) larvae. *88th Kansas (Central States) Entomological Society Annual Meeting*. 7 April 2012
- McKay, T. Integrated Insect Pest Management in Rice Mills. Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions. Orlando, FL. 7 November 2012
- ‡White, A. L., **T. McKay**, J. F. Campbell, and F. Arthur. Population dynamics of stored-product insects at a rice mill in northeast Arkansas. *The 59th Annual Meeting of the Entomological Society of America*. Reno, NV. 15 November 2011

McKay, T. and T. Bianco. Potential vectors of dog heartworm (*Dirofilaria immitis*) in northeast Arkansas. *The 58th Annual Meeting of the Entomological Society of America*. San Diego, CA. 14 December 2010

‡Gaspar, J., **T. McKay** and M. Huss. Trichomycete fungi associated with mosquito larvae in northeastern Arkansas. *The 58th Annual Meeting of the Entomological Society of America*. San Diego, CA. 13 December 2010

‡Gaspar, J., **T. McKay** and M. Huss. Trichomycete fungi associated with mosquito larvae in Northeastern Arkansas. *Arkansas Entomological Society Annual Meeting*, Fayetteville, AR. 8 October 2010

‡Gaspar, J., **T. McKay** and M. Huss. Trichomycete fungi associated with mosquito larvae in Northeastern Arkansas. Fall Conference, *Arkansas Chapter of the Wildlife Society*, Arkansas State University, Jonesboro, AR. 30 September 2010

***McKay, T.** Arkansas dung beetle study – The biodiversity of dung beetles in Arkansas. Dung Beetle Field Day, University of Missouri, Hugo Wurdack Farm, Cook Station, MO. 18 August 2010

***McKay, T.** Management of fly larvae in livestock systems using parasitic wasps and predators. Dung Beetle Field Day, University of Missouri, Hugo Wurdack Farm, Cook Station, MO. 18 August 2010

Hinkle, N. C. and **T. McKay**. The future of Cooperative Extension and its relationship with the Agricultural Experiment Station scientist as related to control of arthropods affecting livestock. *54th Livestock Insect Workers Conference*, Knoxville, TN. 27-30 June 2010

***McKay, T.** Potential Vectors of Dog Heartworm in Jonesboro, AR. Sponsored by Novartis Animal Health. Spring 2010 Tour of the Mississippi Delta giving this talk seven times to veterinarians. May 4 Jackson MS, May 17 Greenville MS, May 18 Jackson MS, May 19 Alexandria MS, & Lafayette LA, May 20 Louisiana State University Veterinary School Baton Rouge LA, June 24 Sikeston MO.

McKay, T., C.A. Ross, S. Vanderpool, and K. Yanowitz. House flies in the science classroom: Perspectives from a summer camp. *84th Annual Meeting of the Southeastern Branch Meeting*, Entomological Society of America, Atlanta, GA. 7-10 March 2010

Ross, C. A., K. L. Yanowitz, **T. McKay**, and S. S. Vanderpool. Crime pays big dividends in the science classroom. *National Science Teachers Association Annual Conference*, Philadelphia, PA. 18-21 March 2010

***McKay, T.** A survey of potential mosquito vectors of dog heartworm, *Dirofilaria immitis*, in Jonesboro, Arkansas. Advisory Board Meeting, Novartis Animal Health, Charlotte NC. 18 February 2010

POSTERS PRESENTED - McKay

*Gaspar, J. **T. McKay**, and M. Huss. Trichomycete fungi associated with mosquito larvae in northeastern Arkansas. *The 59th Annual Meeting of the Entomological Society of America*. Reno, NV (President's Award, first place Graduate Student Poster Display Competition, MUVE2) 14 November, 2011

Yanowitz, K. L., **T. McKay**, C. A. Ross, and S. S. Vanderpool. The impact of participating in a STEM camp on career goals. *Annual Conference of the Association for Psychological Science*, Boston, MA. 29 May, 2010

*Quatermass, K. E., *T. A. Bianco and **T. McKay**. Do heartworm positive dogs increase infection in mosquitoes? Research Internships in Science of the Environment Poster Presentations, Arkansas State University, Jonesboro, AR. 6 August, 2010.

Grants- McKay

Pratte, J., T. Marsico, A. Hashim and T. McKay. The Experiential Learning Fellowship (ELF) Program. 2011-2016. \$567,185.

McKay, T., F. Arthur, J. F. Campbell, L. T. Wilson, Y. Yang, B. Adam, T. E. Reagan. Integrated pest management programs to reduce reliance on methyl bromide fumigation in rice mills. Sept. 1, 2011 – August 31, 2014. \$450,502.

McKay, T. The efficacy of lufenuron and fipronil used in an integrated flea control program in an Arkansas horse facility: a case study. Novartis Animal Health, July 11, 2011 – November 30, 2011. \$15,010.07.

Yanowitz, K. S. Vanderpool, T. McKay and A. Ross. CSI: Classroom Student Investigations. National Science Foundation 04-611 ITEST program, provide training to teachers and students on STEM careers and information technology. June 1, 2011-May 31, 2014. \$1,000,000.

McKay, T. Attraction of natural populations of adult female mosquitoes. Susan McKnight, Inc. Aug. 15, 2010 – Nov. 15, 2010. \$5,250.

Thomas Risch, Professor of Animal Ecology

Publications – Risch

- Pannkuk, E.L., Risch, T., & B. Savary. 2013. Profiling the triacylglyceride contents in bat integumentary lipids by preparative thin layer chromatography coupled to MALDI-TOF mass spectrometry. *Journal of Visualized Experiments*.
- Pannkuk, E.L., Gilmore, D., Savary, B., & T. Risch. 2012. Triacylglyceride (TAG) profiles of integumentary lipids isolated from three bat species determined by matrix-assisted laser desorption–ionization time-of-flight mass spectrometry (MALDI–TOF MS). *Canadian Journal of Zoology*. 90:1117–1127.
- Brandebura, S. C., E. L. Pannkuk, and T. S. Risch. 2011. Indiana Bat (*Myotis sodalis*) Maternity Colonies in Arkansas. *Southeastern Naturalist* 10:529-532.
- Medlin, R. E. Jr, M. B. Connior, K. F. Gaines and T. S. Risch. 2010. Responses of bats to forest fragmentation in the Mississippi River Alluvial Valley, Arkansas, USA. *Diversity* 2:1146-1157; doi:10.3390/d2101146.
- Connior M. B., A. A. Kershen, R. E. Medlin Jr, D. A. Elrod, D. B. Sasse, and T. S. Risch. 2010. Distribution and habitat attributes of an endemic subspecies of pocket gopher. *American Midland Naturalist* 164:217–229.
- Robinson, T. J., L. M. Siefferman, and T. S. Risch. 2010. Seasonal tradeoffs in reproductive investment in a multi-brooded passerine. *Condor* 112:390-398.
- Connior, M. B., and T. S. Risch. 2010. Home range and survival of the Ozark pocket gopher in Arkansas. *American Midland Naturalist* 64:80-90.

Presentations – Risch

- Pannkuk, E., N. Fuller, D. Gilmore, B. Savary, T. Risch. Variation in the surface lipid content of bats. Southeastern Bat Diversity Network- Pikeville, TN. February 2013.
- Blair*, H.(presenting author), E. Pannkuk, A. Fisher*, K. Arter*, C. Gerdes*, B. Savary, T. Risch. Why does *Geomyces destructans* infect bats? Southeastern Bat Diversity Network- Pikeville, TN. February 2013. Award: Best Student Poster.
- Gillies, K. (presenting author), SBDN WNS committee. Poster: Southeastern Cave Bats: Reservoirs for Future Populations, K. Gillies (presenting author), SBDN WNS Committee. Southeastern Association of Fish and Wildlife Agencies- Hot Springs, AR October 2012
- Pannkuk, E., N. Fuller, B. Savary, and T. Risch. Oral: Lipid profiles of bat integument: A comparison of glycerolipid contents among species and tissues, North American Society for Bat Research- San Juan, Puerto Rico. October 2012. Award: Southeastern Bat Diversity Network Student Travel Award.
- Banks, A.*(presenting author), E. Pannkuk, C. Gerdes*, A. Greco*, L. Spencer*, B. Savary, T. Risch, and N. Fuller. Poster: Sebaceous lipid profiles of bats with wing damage associated with white nose syndrome, North American Society for Bat Research- San Juan, Puerto Rico. October 2012.
- Pannkuk, E., D. Gilmore, B. Savary, T. Risch. Poster: Biochemical analysis of *Geomyces* proteases to understand putative function in pathogenicity of White-Nose Syndrome, National White-Nose Syndrome Symposium- Madison, WI. June 2012.
- Gerdes, C.*(presenting author), A. Fisher*, H. Blair*, E. Pannkuk, T. Risch. Poster: Effects of fatty acids on

Geomyces destructans growth and sporulation, Create AState- Jonesboro, AR. April 2012. Award: 3rd Place Poster

Pannkuk, E. L., Gilmore, D. F., Savary, B. J., and T. S. Risch.

Investigations into the host/pathogen ecology of the bat disease White-Nose Syndrome. Midwest Bat Working Group, April 5-6 2012, Terra Haute, IN.

Gerdes, C., Fischer, A., Blair, H., Pannkuk, E. L., and T.S. Risch:

Effects of fatty acids on *Geomyces destructans* growth and sporulation. Southeastern Bat Diversity Network, February 23-24, 2012, Louisville, MS. Poster Presentation.

Pannkuk, E. L., Gilmore, D. F., Savary, B. J., and T. S. Risch.

Why would a fungus grow on a bat and how can we investigate the process. Southeastern Bat Diversity Network, February 23-24, 2012 Louisville, MS.

Fischer, A., Blair, H., Pannkuk, E. L., and T.S. Risch.

Toxicity of Anionic and Nonionic Surfactants on *Geomyces*. Sigma Xi, November 10-13, 2011. Raleigh, NC Poster Presentation.

Pannkuk, E. L., Savary, B. J., and T. S. Risch.

The Lipids of Chiropteran Integument: Characterization of Triacylglyceride Molecules from Three Species of Bats. North American Symposium for Bat Research, October 26-29, 2011, Toronto, ON.

Pannkuk, E. L., Gilmore, D. F., Savary, B. J., and T. S. Risch.

Application of matrix assisted laser desorption/ionization time-of-flight mass spectrometry for the analysis of bat integumentary biomolecules and *Geomyces* enzymes MidSouth SETAC Regional Chapter Meeting, May 19-20, 2011, Jonesboro, AR.

Pannkuk, E. L., Gilmore, D. F., Savary, B. J., and T. S. Risch.

Application of matrix assisted laser desorption/ionization time-of-flight mass spectrometry for the analysis of bat integumentary biomolecules and *Geomyces* enzymes. National White-nose Research Symposium, May 16-19, 2011, Little Rock, AR. Poster Presentation.

Fischer, A., Pannkuk, E. L., and T.S. Risch.

Growth of *Geomyces* on Fatty Acid Media. National Conference in Undergraduate Research, March 31-April 2, 2011, Ithica, NY.

Pannkuk, E. L., Savary, B. J., and T. S. Risch.

Identification of Integumentary Degrading Proteases in *Geomyces* by Peptide Mass Fingerprinting. Southeastern Bat Diversity Network, February 23-26, 2011, Louisville, KY.

Pannkuk, E. L., Gilmore, D. F., Benjamin, E. T., Benjamin, E. and T. S. Risch. White-nose Syndrome: Fungal Metabolism of Fatty Acids and Lipid Transport. 2010 Sigma Xi Annual Meeting & International Research Conference, November 13, 2010. Raleigh NC. Poster Presentation.

Pannkuk, E. L., Gilmore, D. F., Benjamin, E. T., Benjamin, E. and T. S. Risch. Differential Effects of Fatty Acids on Growth of the White-nose Fungus *Geomyces destructans*. Annual Meeting of the South Central Branch of the American Society for Microbiology, October 29-30, 2010, Hattiesburg, MS. Poster Presentation.

Pannkuk, E. L., Gilmore, D. F., Benjamin, E.T., Benjamin, E. and T. S. Risch.

White-nose Syndrome: Fungal Metabolism of Fatty Acids and Lipid Transport. North American

Society for Bat Research, Denver CO, October 29, 2010. Poster Presentation.

Pannkuk, E. L., Gilmore, D. F., Benjamin, E., Huss, M. J. and T. S. Risch Fungal Metabolism of Chiropteran Integument. Midwest Bat Working Group, Terre Haute IN. June 6, 2010.

Pannkuk, E. L., Savary, B. J., Gilmore, D. F., Benjamin, E. T., Huss, M. J. and T. S. Risch. Fungal digestion of chiropteran integument. National White-nose Syndrome Research Symposium, Pittsburgh PA, May 25, 2010. Poster Presentation.

Risch, T.S. and T. L. Klotz.

A Long-Term study of Temperature and Disturbance at Roosts Sites of the Ozark Big-eared Bat (*Corynorhinus townsendii ingens*). Symposium on Conservation and Management of Big-eared Bats in the Eastern United States. March 9-10, 2010. Athens, Georgia.

Connior, M. B., and T. S. Risch.

Ecology of Pocket Gophers (*Geomys*) in Arkansas. Annual Meeting of the Texas Academy of Science. March 4-6, 2010. Tarleton State University, Stephenville, Texas.

Baxter-DeViney, S. A., and T. S. Risch.

Are Structurally Produced Plumage Colors Honest Signals of Quality? 128th Stated Meeting of the American Ornithologists' Union. February 7 - 11, 2010. San Diego, California.

Grants – Risch

1. Risch, T.S, Pannkuk, E., D. Gilmore, B. Savary, White-Nose Syndrome: Pathogenicity of *Geomyces destructans* and the Role of Secreted Extracellular Enzymes in Host/Pathogen Ecology. Arkansas Game and Fish Commission. 2013-2015. \$70,936.
2. Risch, T.S. Habitat Use by Interior Least Terns (*Sternula antillarum*) and Migratory Shorebirds of Wetland Sites and Fish Farms in the Mississippi Alluvial Valley, Arkansas. Arkansas Game and Fish Commission. 2012-2014. \$100,000.
3. Risch TS, Johnson, RJ and Neupane, D. Genetic study of Asian elephant (*Elephas maximus*) herds in eastern Himalayan region. United States Fish and Wildlife Service, Asian Elephant Conservation Fund (ASE-0578). 2012-2013. \$49,997.
4. Risch, T.S. Biochemical and Biomechanical Effects of *Geomyces* Protease Activity on Chiropteran Integument. Surf Undergraduate Research Fellowship (Student, Cheyenne Gerdes). 2012. \$4,000.
5. Risch, T.S. The Effects of Prescribed Burns on Eastern Wild Turkey Habitat Use and Demography in a Shortleaf Pine-Bluestem Grass Ecosystem. 2011-2014. \$97,500.
6. Risch T.S. ASU Single Turbine Study Plan. United States Fish and Wildlife Service. 2011-2013. \$40,000
7. Risch, T.S. Lipid Analysis of Arkansas Bat Integument, Fungal Fatty Acid Metabolism, and Control of White-nose Syndrome in Arkansas. Arkansas Game and Fish Commission. 2010-2012. \$42,790.
8. Risch, T.S. Short-term impacts of a major oil spill on Black Skimmers in the Gulf of Mexico: identification of vital use areas and recommendations to enhance population recovery. USFWS. 2010-2014. \$44,025.
9. Risch, T.S. Bottomland Forest and Canebrake Management to Improve Habitat Quality for Understory Bird Species. USFWS. 2010-2016. \$53,000.
10. Risch, T.S. Waterfowl Movements on Habitat Restored Wetlands. USFWS. 2010-2013. \$25,000.

11. Risch, T.S., and Grippio, R.S. Planning Grant for the George Harp Environmental Field Station. National Science Foundation. 2010-2012. \$23,151.
12. Bayless. M., T.S. Risch, D.A. Saugey, D.B. Sasse, and N. Hollenbach. Conserving Rafinesque's Big-eared Bats and Southeastern Myotis Roosting Habitat in Arkansas. 2010-2012. Arkansas Game and Fish Commission. \$72,332.
13. Pratte, J.M., Bouldin, J.L., Risch, T.S. 2009-2011. (\$388,945) NSF Research Experiences for Undergraduates: Research Internships in Science of the Environment. (NSF#DBI-0552608).
14. Risch, T.S., and E.L. Pannkuk. Fungal Digestion of Chiropteran Integument. National Speleological Society. 2009-2010. \$5,800.
15. Risch, T.S. Mist-Netting Surveys for Endangered Bats. US Forest Service, Ozark-Saint Francis National Forest. 2008-2013. \$509,670.
16. Risch, T.S. Swainson's Warblers Habitat Management. 2008-2013. US Forest Service. \$74,500
17. Bouldin, J.L., Grippio, A.A., Kennon J.T., Miller, C.A., Risch, T.S. 2008-2013. (\$2,242,587) NSF Division of Graduate Education. GK-12 Environmental Sciences and Molecular Biosciences in the Natural State. (NSF#0809317).

Virginie Rolland, Assistant Professor of Quantitative Wildlife Ecology

Publications – Rolland

- Barbraud C., Rolland V., Jenouvrier S., Nevoux M., Delord K., and Weimerskirch H. Effects of climate change and fisheries bycatch on Southern Ocean seabirds: a review. *Marine Ecology Progress Series* 454: 285-307.
- Brischoux F., Rolland V., Bonnet X., Caillaud M., and Shine R. Effects of oceanic salinity on body condition in sea snakes. *Integrative and Comparative Biology*. 2012, 52, (2), 235-244.

Presentations - Rolland

- Fowler J.* and Rolland V. Effects of temperature on Eastern Bluebird winter nest box use. Association of Field Ornithologists, Venice, Florida. March 28-30, 2013.
- Rolland V. Climate change, Overexploitation, and Bird Populations. Smithsonian Conservation Biology Institute, Front Royal, Virginia. July 25, 2012
- Bobowski M*, Bednarz J., Risch T., Marsico T, and Rolland V. Foraging behaviour and decision strategies by overwintering Red-tailed Hawks and American Kestrels in relation to prey density and patch-site characteristics. North American Ornithology Conference, Vancouver, Canada. August 15-18, 2012.

Paul C. Sikkel, Assistant Professor of Marine Ecology

Publications - Sikkel

- McCammon, A. Sikkel, P.C., Nemeth, D. 2010. Effects of three Caribbean cleaner shrimps on ectoparasitic monogeneans in a semi-natural environment. *Coral Reefs* 29: 419-426.
- Sikkel, P.C., Fuller, C.A 2010. Maintenance of kin groups by juvenile black surfperch (*Embiotoca jacksoni*). *Journal of Fish Biology* 76:1671-1681.
- Sikkel, P.C., Sears, W.T., Weldon, B. Tuttle, B. C., 2011. An experimental field test of host-finding mechanisms in a Caribbean gnathiid isopod *Marine Biology* 158: 1075-1083.
- Farquharson, C, Smit, N.J., Sikkel, P.C. 2012. Description of a new species of gnathiid (Crustacea, Isopoda, Gnathiidae) from the Caribbean *Zootaxa* 3381: 47-61.
- Sikkel, P.C., Sikkel, N.M. 2012. Spawning and social organization in Hawai'ian Ambon Toby, *Canthigaster amboienensis*. *Ichthyological Research* 59: 394-395.
- Artim, J.M., Sikkel, P.C. (in press). Live coral repels a common reef-fish ectoparasite. *Coral Reefs*.
- Coile, A.M., Sikkel, P.C. (in press). Susceptibility of common Caribbean reef fishes to generalist ectoparasitic gnathiid isopods. *Parasitology*.
- Welicky, R.M., Coile, A.M, McCammon, A., Cheney, K.L., Sikkel, P.C. (in press). Lunar periodicity of activity of ectoparasitic gnathiid isopods on Caribbean coral reefs. *Marine Biology*

Invited Popular Articles - Sikkel

- Malik, A.D., Sikkel, P.C. PR Pros and scientists: A 10-tip formula for collaborating. *Ragan.com*, May 2010
- Sikkel, P.C. Reefs to Reggae – *Livescience.com* (in press)

Invited Presentations - Sikkel

2010 Dept. of Biology, University of Memphis, Memphis TN

Dept. of Environmental Science, University of San Diego

2011 Division of Science and Mathematics, University of the Virgin Islands

Coral Reef Triangle Partnership for International Research and Education Symposium, Silliman University, Dumaguete Philippines

Symposium on lionfish invasion: International Marine Conservation Congress, Victoria, Canada
Department of Biology, University of Tulsa, Tulsa, OK

2012

Department of Marine and Environmental Science, University of Technology, Sydney Australia

Department of Biology, University of Mississippi, Oxford, MS.

Sea and Learn 2012 - Saba, Netherlands Antilles (<http://www.seaandlearn.org/experts.htm>) ;

http://www.youtube.com/watch?v=tr6ixmih_ck

2013

Department of Zoology, North-West University, Potchefstroom, South Africa

Current grants – Sikkel

2012 National Science Foundation (P.C. Sikkel, PI) 299,000

Malathi Srivatsan – Associate Professor of Neurobiology

Publications - Srivatsan

- Badanavalu M. Prabhu, Fabricio Medina-Bolivar, Jose Condori, Ganapathy Sivakumar, Malathi Srivatsan (2013) Neuroprotective effects of peanut hairy root extract against oxidative stress in PC 12 cell derived neurons. Journal of Medicinally active plants (in press).
- Jining Xie, Linfeng Chen, Vijay K. Varadan, Sahitya Chetan, Malathi Srivatsan (2011) Magnetic nanotubes influence the response of Dorsal root ganglion neurons to alternating magnetic fields . J. Nanotech. Eng. Med. Vol. 2 / 031009-1, [DOI: 10.1115/1.4004305]
- Linfeng Chen; Jining Xie; Kiran R. Aatre; Justin Yancey; Sahitya Chetan; Malathi Srivatsan; Vijay K. Varadan (2011) Synthesis of hematite and maghemite nanotubes and study of their applications in neuroscience and drug delivery. SPIE, 7980, DOI: 10.1117/12.881843
- Amy R. Pearce and Malathi Srivatsan (2011) Volunteerism is Key to Offering Successful Neuroscience Outreach with Limited Resources. Journal of Undergraduate Neuroscience Education (JUNE), Spring 2011, 9(2):A62-A65
- Linfeng Chen, Jining Xie, J. Yancey, Malathi Srivatsan, and Vijay K. Varadan (2010)
- Biocompatibility and delivery of NGF by hematite nanotubes for differentiation of PC12 cells. J. Nanotech. Eng. Med. 1: 041014-3.
- Prabhu, B., Ali, S. F., Hussain, S. M., Srivatsan, M. (2010) Copper nanoparticles exert size and concentration dependent toxicity on somatosensory neurons of rat. Nanotoxicology, 1;4(2):150-160.
- Malathi Srivatsan, Mahadevappa Badanavalu, Madhumita Paul, Jining Xie, Linfeng Chen and
- Vijay K. Varadan (2010) . Nanomaterials for Developing Therapeutic Measure for Repair in the Nervous System. ASME Proceedings: NEMB2010-13201.
- Jining Xie, Linfeng Chen, M. Srivatsan, Vijay K. Varadan (2010) Magnetic iron oxide nanotubes and their neuronal applications, Proceedings of ASME 2010 First Global Congress on NanoEngineering for Medicine and Biology, NEMB2010.

Presentations - Srivatsan

- Srivatsan, M. (2012) "Funding Opportunities for Translational Research" at the NSF Minority Faculty Development Workshop held at Georgia Tech, Atlanta, GA from 03/16 TO 03/18/2012
- Srivatsan, M. (2012) "ASU:IACUC Guidelines" Spring Faculty Development workshop, ASU, Jonesboro, April, 2012
- Srivatsan, M. (2011) Broadening participation in innovation: NSF SBIR/STTR, at symposium on "Diversity as a Catalyst for Innovation in the Sciences: Connecting Women and Under-Represented Innovators to Regional Resources" at Skandalaris Center for Entrepreneurial Studies, Washington University, St. Louis, July 25th, 2011.
- Srivatsan, M. and Narayanan, K. (2011) Broadening participation in economic growth through industrial innovations and partnerships at 4th annual conference on Understanding Interventions, Nashville, TN, May 26-28, 2011.

- Srivatsan, M. (2011) Entrepreneurship as a career path for graduates and faculty in engineering at annual conference of "Quality Education for Minority" Baltimore, MD, May 13th, 2011.
- Daniel, J., Pingel, C. J., Srivatsan, M. (2011) From airways to neurons: Retrograde transport of nanomaterials, 3rd annual conference on Nanotechnology for Healthcare, PetitJean, AR, April 6-9, 2011.
- Pearce, A., Srivatsan, M., Grippo, A., Lovelace, A. (2011) Introducing Inquiry-Based Investigation in Biology Laboratories: Does Neem Provide Bioprotection Against Bean Beetles? AAAS annual meeting, Washington D.C., February 2, 2011.
- Pingel, C. J., Srivatsan, M. (2010). Determination of retrograde transport of nanomaterials from airways to neurons (vol. 40). : Society for Neuroscience. Annual conference of Society for Neuroscience, San Diego, CA, November, 2010.
- Paul, M., Srivatsan, M. (2010). Exposure to cigarette smoke during pregnancy in rats: Effects on adult behavior and neonatal nicotinic receptor levels (vol. 40): Society for Neuroscience. Annual conference of Society for Neuroscience, San Diego, CA, November, 2010.
- Badanavalu, M., Pandanaboina, S., Srivatsan, M. (2010). Neuroprotective effect of nicotine against nerve growth factor withdrawal in superior cervical ganglion neurons (vol. 40): Society for Neuroscience. Annual conference of Society for Neuroscience, San Diego, CA, November, 2010.
- Medina-Bolivar, F., Condori, J. Atwill, R. L. Nopo, C. Nopo, L. Carrier, D. J. Srivatsan, M. Nair, V. Sivakumar, G. Dolan, M. C. (2010) ABI Fall Research Symposium, "Bioproduction of bioactive prenylated resveratrol analogs in root cultures," Arkansas Biosciences Institute, Little Rock, Arkansas. (September 29, 2010).
- Medina-Bolivar, F., Condori, J. Nopo-Olazabal, L. Nopo-Olazabal, C. Carrier, D. J. Srivatsan, M. Sivakumar, G. Dolan, M. C. (2010) 1st International Conference of Resveratrol and Health, "Natural prenylated resveratrol analogues from root cultures: Induced biosynthesis, purification and biological activity," Helsingor, DENMARK. (September 13, 2010).
- Medina-Bolivar, F., Condori, J. Nopo-Olazabal, C. Nopo-Olazabal, L. Dolan, M. C. Carrier, D. J. Srivatsan, M. Sivakumar, G. Nair, V. Hubstenberger, J. International Conference on Polyphenols, "Biosynthesis of monomeric and oligomeric stilbenoids in hairy root cultures of peanut and muscadine grape," Montpellier, FRANCE. (August 24, 2010)
- Medina-Bolivar, F., Condori, J. Carrier, D. J. Srivatsan, M. Radomska-Pandya, A. Sivakumar, G. Nair, V. Dolan, M. C. . 1st Annual Conference of the American Council for Medicinally Active Plants, "Natural resveratrol analogs from root cultures of peanut and muscadine grape: bioproduction, biotransformation and bioactivity," New Brunswick, NJ. (July 20, 2010).
- M. Srivatsan (2010) Interactions of Nanomaterials and Neurons: Potential Applications and Concerns" at the Fifth International conference on Bioengineering held at Izmir, Turkey in June, 2010.
- Malathi Srivatsan, Mahadevappa Badanavalu, Madhumita Paul, Jining Xie, Linfeng Chen and Vijay K. Varadan (2010) Nanomaterials for Developing Therapeutic Measure for Repair in the Nervous System. ASME 2010 First Global Congress on NanoEngineering for Medicine and Biology (NEMB2010) in Houston, TX. Feb. 9, 2010
- Badanavalu, M, Ali, S. F., Hussain, S. M., Srivatsan, M., (2010) Copper nanoparticles exert concentration and size-dependent toxicity on somatosensory neurons of rat, Second Annual Nanotechnology and Healthcare Conference, Arkansas Nanotechnology consortium, Winthrop Rockefeller Institute, Petit Jean, Arkansas. (January 9, 2010).

Srivatsan, M. Schirmer, S. Yancey, J., Xie, J. Chen, L., Varadan, V. (2010) Nanomaterials for neuroregeneration, Second Annual Nanotechnology and Healthcare Conference, Arkansas Nanotechnology consortium, Winthrop Rockefeller Institute. (January 7, 2010).

Grants - Srivatsan

2012-2013	2012 P.I. on "Organophosphate toxicity on sensory neurons" \$5,000
2009-2012	Campus Lead and Co-PI on NSF CRI-II 0855248 "Stream Computing for Research and Education in Science and Engineering" Direct cost \$400,000
2010-2013	Co-PI on NSF MRI-R2 0960089 "Acquisition of Equipment for Investigating Biodynamic Interactions," \$1,070,851.
2011	Student Undergraduate Research Fellowship grant from Arkansas Dept. of Higher Education, "Transport of nanomaterials from airways to neurons" Direct Cost \$2250
2008-2010	Campus Lead and Co-PI on NSF EPSCoR 0701890 " Develop infrastructure for Wireless, Nano, Bio, Neuro sensors". Direct cost, \$4,500,000.
2010	P.I. on INBRE Equipment subaward for Epifluorescence and Camera attachments for Stereo microscope, \$12,002
2010	P.I. on "Use of stem cells for functional recovery in spinal cord injury": Collaborative research at Center for Brain Research at Ege University, Turkey: ASU Middle East Studies Grant, \$7,500.
2010	ABI Summer research support for undergraduate and graduate students, \$ 4,000
2006-2010	P.I. on NIH/NIDA R15 019971 "Nicotine and development of autonomic neurons". \$194,000.
2006-2010	P.I. on NIH/NCRR INBRE P20 RR-16460 funded project on "Cholinergic mechanism in neuroregeneration ". \$471,140

Stan Trauth – Professor of Zoology

Publications - Trauth

2010

- McAllister, C. T., C. R. Bursey, J. A. Crawford, A. R. Kuhns, C. Shaffer, and S. E. Trauth. 2010. Metacercariae of *Clinostomum* (Trematoda: Digenea) from three species of *Ambystoma* (Caudata: Ambystomatidae) from Arkansas and Illinois, U.S.A. *Comparative Parasitology* 77(1):25-30.
- Siegel, D. S., S. E. Trauth, D. M. Sever, and R. D. Aldridge. 2010. The phylogenetic distribution of the ampulla ureter and ampulla urogenital/uriniferous papilla in the Serpentes. *Journal of Zoological Systematics and Evolutionary Research*, no. 48 doi: 10.1111/j.1439-0469.2010.00576.x.
- Drake, D. L. and S. E. Trauth. 2010. *Spea intermontanus* (Great Basin Spadefoot). *Algal Symbiosis. Herpetological Review* 41:481-482.
- Connior, M. B. and S. E. Trauth. 2010. Seasonal Activity of the Ozark Highlands Leech, *Macrobdella diploptertia*, (Annelida: Hirudinea) in North-central Arkansas. *Journal of the Arkansas Academy of Science* 64:77-79.

2011

- Milanovich, J. M., S. E. Trauth, and D. A. Saugey. 2011. Reproductive and population structure of a woodland salamander after a prescribed burn in southwest Arkansas. *Southwestern Naturalist* 56:172-179.
- Trauth, S. E. and D. M. Sever. 2011. Male urogenital ducts and cloacal anatomy. Pp. 412-475. *In* Reproductive biology and phylogeny of snakes. (Edited by Robert D. Aldridge and David M. Sever; Series Editor: Barrie G.M. Jamieson). CRC Press, Boca Raton, FL.
- Stanley, J. W. and S. E. Trauth. 2011. *Nerodia rhombifer* (Diamondback Watersnake). Intersexuality. *Herpetological Review* 42:296.
- Moser, W. E., D. J. Klemm, A. J. Phillips, S. E. Trauth, R. G. Neal, J. W. Stanley, and J. E. Flotemersch. 2011. New distributional records of *Philobdella gracilis* Moore, 1901 (Hirudinida: Macrobdellidae). *Comparative Parasitology* 78:387-391.
- McCallum, M.L., C. Brooks, R. Mason, and S. E. Trauth. 2011. Growth, reproduction, and life span in Blanchard's Cricket Frog (*Acris blanchardi*) with notes on the growth of the Northern Cricket Frog (*Acris crepitans*). *Herpetology Notes* 4:25-35.
- McCallum, M.L., W. E. Moser, B. A. Wheeler, and S.E. Trauth. 2011. Amphibian infestation and host size preference by the leech *Placobdella picta* (Verrill, 1872) (Hirudinida; Rhyncho bdellida: Glossiphoniidae) from the eastern Ozarks, USA. *Herpetology Notes* 4:147-151.
- Sawyer, J. A. and S. E. Trauth. 2011. Seasonal activity, population characteristics, and age estimation in the aquatic salamander, *Siren intermedia nettingi* (Goin). *Journal of the Arkansas Academy of Science* 65:117-125.
- Trauth, S. E. 2011. Rapid reservoir inundation causes complete extirpation of the eastern collared lizard (*Crotaphytus collaris*) along the shoreline of Bull Shoals Lake in northern Arkansas. *Journal of the Arkansas Academy of Science* 65:133-137.
- McAllister, C. T., H. W. Robison, R. S. Seville, Z. P. Roehrs, and S. E. Trauth. *Caryospora duszynskii* (Apicomplexa: Eimeriidae) from the Speckled Kingsnake, *Lampropeltis holbrooki* (Reptilia: Ophidia), in Arkansas: Three New Host Records with a Summary of Previous Reports. *Journal of the Arkansas Academy of Science* 65:176-179.
- Siegel, D., A. Miralles, S. E. Trauth, and R. D. Aldridge. 2011. The phylogenetic distribution and morphological variation of the "pouch" in female snakes. *Acta Zoologica* doi:10.1111/j.1463-6395.2011.00514.x.
- McCallum, M. L., S. E. Trauth, B. A. Wheeler, and R. L. Shelton. 2011. Body condition of hatchling alligator snapping turtles (*Macrochelys temminckii*) confiscated from the illegal international wildlife trade. *Herpetological Notes* 4:363-367.

2012

- Connior, M. B. S. E. Trauth, and C. T. McAllister. 2012. Geographic distribution. *Storeria occipitomaculata* (Red-bellied Snake). *Herpetological Review* 43:108.
- McAllister, C. T., C. R. Bursey, S. E. Trauth, and W. R. Hiler. 2012. *Urosaurus ornatus wrighti* (Northern Tree Lizard). Nematode parasite. *Herpetological Review* 43(1):142-143.
- Brown, C. E., S. E. Trauth, R. S. Grippio, B. J. Gurley, and A. A. Grippio. 2012. Combined effects of ephedrine-containing dietary supplements, caffeine, and nicotine on morphology and ultrastructure of rat hearts. *Journal of Caffeine Research* 2(3):123-132.
- Meshaka, W. E., Jr., S. E. Trauth, K. M. Talbott, and C. J. Schmidt. 2012. Reproductive characteristics and sexual maturity of the eastern collared lizard, *Crotaphytus collaris* (Say, 1823), at the northern edge of its geographic range. *Collinsorum* 1(2/3):9-14.
- Trauth, S. E. 2012. Morphology of Rathke's glands in the snapping turtle, *Chelydra serpentina*, with comments on the presence of multilaminar lamellar bodies in turtles. *Journal of the Arkansas Academy of Science* 66 (in press).
- Stanley, J. W., J. R. Engelbert, M. K. Patrick, J. A. Sawyer, and S. E. Trauth. 2012. Population dynamics of mole salamanders (*Ambystoma talpoideum*) in a northeast Arkansas pond. *Journal of the Arkansas Academy of Science* 66 (in press).

2013

- McAllister, C. T., S. E. Trauth, and M. V. Plummer. 2013. A new host record for *Mesocetoides* sp. (Cestoidea: Cyclophyllidae: Mesocetoididae) from a rough green snake, *Opheodrys aestivus* (Ophidia: Colubridae), in Arkansas, U.S.A. *Comparative Parasitology* 80(1):130-133.
- McAllister, C. R. Bursey, M. B. Connior, and S. E. Trauth. 2013. Symbiotic protozoa and helminth parasites of the Cajun chorus frog, *Pseudacris fouquettei* (Anura: Hylidae), from southern Arkansas and northeastern Texas. *Comparative Parasitology* 80(1):96-104.
- Trauth, S. E., J. M. Walker, and J. E. Cordes. 2013. *Aspidoscelis laredoensis* (Laredo Striped Whiptail). Gynandromorph. *Herpetological Review* 44(1):138-140.
- Siegel, D. S., R. D. Aldridge, J. L. Rheubert, K. M. Gribbins, D. M. Sever, and S. E. Trauth. 2013. The testicular sperm ducts and genital kidney of male *Ambystoma maculatum* (Amphibia, Urodela, Ambystomatidae). *Journal of Morphology* 274:344-360.
- Trauth, S. E., J. M. Walker, and J. E. Cordes. *Aspidoscelis laredoensis* x *Aspidoscelis gularis* (Laredo Striped Whiptail x Texas Spotted Whiptail. hybrid gynandromorph. *Herpetological Review* (in press).
- Trauth, S. E., J. M. Walker, and J. E. Cordes. *Aspidoscelis laredoensis* x *Aspidoscelis gularis* (Laredo Striped Whiptail x Texas Spotted Whiptail. spermatogenesis. *Herpetological Review* (in press).
- Crump, B. G., S. E. Trauth, and J. F. Crump. Geographic distribution. *Crotalus horridus* (Timber Rattlesnake). *Herpetological Review* (in press).
- Trauth, S. E. and M. V. Plummer. 2013. Comparative histology, histochemistry, and ultrastructure of Rathke's glands in hatchlings of two species of North American box turtles. *Chelonian Conservation and Biology* 12 (in press).
- Hiler, W. R., B. A. Wheeler, and S. E. Trauth. 2013. The decline of the Ozark hellbender (*Cryptobranchus alleganiensis bishopi*) in the Spring River, Arkansas, USA. *Herpetological Conservation and Biology* 8 (in press).

Presentations - Trauth

- Trauth, S. E. 2010. Ultrastructural Observations of the Secretory Epithelium of the Distal Genital Tract in the Flathead Snake, *Tantilla gracilis*. 94th Annual Meeting of the Arkansas Academy of Science, Little Rock, AR. April 9-10, 2010.
- Trauth, S. E. and D. M. Sever. 2010. Ultrastructural Observations of the Secretory Epithelium of the Distal Genital Tract in the Flathead Snake, *Tantilla gracilis*. Joint Annual Meeting of Ichthyologists and Herpetologists, Providence, RI, July 7-12, 2010.
- Trauth, S. E. 2010. Winter/Spring Precipitation in Northern Arkansas and the Risk of Declining Reptilian Biodiversity by Rapid Reservoir Inundation: A Classic Story of the Eastern Collared Lizard,

- Crotaphytus collaris*. Fourth Annual Meeting of the Ozark Studies Symposium, Missouri State University-West Plains, MO, September 23-25, 2010.
- Trauth, S. E. 2011. Winter/Spring Precipitation in Northern Arkansas and the Risk of Declining Reptilian Biodiversity by Rapid Reservoir Inundation: Historic Case of the Eastern Collared Lizard, *Crotaphytus collaris*. Annual Meeting of the Arkansas Academy of Science, University of Arkansas-Monticello, April 9, 2011.
- Trauth, S. E. and D. M. Sever. 2011. Proximal Genital Ducts and Their Ultrastructural Characteristics in Male Flathead Snakes (*Tantilla gracilis*). Joint Annual Meeting of Ichthyologists and Herpetologists, Minneapolis, MN, July 6-11, 2011.
- Drake, D. L. and S. E. Trauth. 2011. Algal Symbiosis in Larval Anurans-A Mechanism for Survival. Joint Annual Meeting of Ichthyologists and Herpetologists, Minneapolis, MN, July 6-11, 2011.
- Stephens, N., S. E. Trauth, C. Cramer, and M. Dolan. 2011. Molecular Ecology of Western Slimy Salamanders in the Spillway Mine, Garland Co., AR. Joint Annual Meeting of Ichthyologists and Herpetologists, Minneapolis, MN, July 6-11, 2011.
- Lancaster, K. F. and S. E. Trauth. 2012. The testicular histology and germ cell cytology of spermatogenesis of the Mississippi map turtle, *Graptemys pseudogeographica kohnii*, from northeastern Arkansas. Arkansas Academy of Science, April 12-14, Magnolia.
- Stanley, J. W., J. R. Engelbert, M. K. Patrick, J. A. Sawyer, and S. E. Trauth. 2012. Population dynamics of mole salamanders (*Ambystoma talpoideum*) in a northeast Arkansas pond. Arkansas Academy of Science, April 12-14, Magnolia.
- Trauth, S. E. 2012. Morphology of Rathke's glands in the snapping turtle, *Chelydra serpentina*, with comments on the presence of multilaminar lamellar bodies in turtles. Arkansas Academy of Science, April 12-14, Magnolia.
- Robinson, G. J. and S. E. Trauth. 2012. Differential use of femoral glands based on foraging strategy in lizards. Arkansas Academy of Science, April 12-14, Magnolia.
- Elston, J. S., J. J. Kelly, and S. E. Trauth. 2012. Turtle usage of urban ditches in an expanding northeastern Arkansas city. Arkansas Academy of Science, April 12-14, Magnolia.
- Hiler, W, B. A. Wheeler, S. E. Trauth, and K. Irwin, Kelly. 2012. Decline of the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) in Arkansas. Joint Meeting of the World Congress of Herpetology and the Joint Meeting of Ichthyologists and Herpetologists. August 7-13, Vancouver, British Columbia.
- Nicholson, A., S. E. Trauth, B. Beran, B. Rabe, and D. Siegel. 2012. The Genital Kidney in Salamanders: Emphasis on Plethodontidae. Joint Meeting of the World Congress of Herpetology and the Joint Meeting of Ichthyologists and Herpetologists. August 7-13, Vancouver, British Columbia.
- Sever, D. M., J. Rheubert, S. E. Trauth, and D. Siegel. 2012. Recent Advances in Our Knowledge of Comparative Cytology of Sex Accessory Organs in Male Squamates. Joint Meeting of the World Congress of Herpetology and the Joint Meeting of Ichthyologists and Herpetologists. August 7-13, Vancouver, British Columbia.
- Siegel, D., R. Aldridge, J. Rheubert, K. Gribbins, D. M. Sever, and S. E. Trauth. 2012. The genital kidney of male *Ambystoma maculatum* (Amphibia, Urodela, Ambystomatidae). Joint Meeting of the World Congress of Herpetology and the Joint Meeting of Ichthyologists and Herpetologists. August 7-13, Vancouver, British Columbia.

Grants - Trauth

Effects of Glade Restoration on Herpetofaunal Communities within Rocky Pinnacle Habitats (Flatside Mountain Region) in the Ouachita National Forest. Challenge Cost-Share Agreement. U.S. Forest Service. 2010. \$35,000.00 (With Jonathan Stanley).

Shiguang Yu – Assistant Professor of Biology

Publications - Yu

Fang Y., S. Yu, J. Ellis, T. Sharav, and H. Braley-Mullen. (2010). Comparison of sensitivity of Th1, Th2 and Th17 cells to Fas-mediated apoptosis. *J Leuk. Biol.* 87:1019-1028.

Yu S., Y. Fang, G. C. Sharp, and H. Braley-Mullen. (2010). Transgenic expression of TGF- β on thyrocytes inhibits development of spontaneous autoimmune thyroiditis and increases regulatory T cells in thyroids of NOD.H-2h4 mice. *J. Immunol.* 184:5352-5359.

Yu S*, Y. Fang, T. Sharav, G. C. Sharp, and H. Braley-Mullen*. (2011). CD8+ T cells induce thyroid epithelial cell hyperplasia and fibrosis. *J. Immunol.* 186:2655-2662. (* Correspondence authors)

Fang Y, S. Yu, and H. Braley-Mullen. (2012) TGF- β Promotes Proliferation of Thyroid Epithelial Cells in IFN- γ (-/-) Mice by Down-Regulation of p21 and p27 via AKT Pathway. *Amer. J. Pathol.* 180:650-660.

Yu, S., J. S. Ellis, R. Dunn, M. R. Kehry, and H. Braley-Mullen. (2012) Transient depletion of B cells in young mice results in activation of T reg that inhibit development of autoimmune disease in adults. *Int. Immunol.*, 24:233-242.

Zhang H, J. Chen, X. Liu, L. Awar, A. McMickle, F. Bai, S. Nagarajan and S. Yu. (2013) IL-17 induces expression of vascular cell adhesion molecule through signaling pathway of NF- κ B, but not Akt1 and TAK1 in vascular smooth muscle cells. *Scand. J Immunol.* 77:230-237.

Kayes T, Y Fang, S Yu, E Downey, S Wang, and H Braley-Mullen. (2013) Agonistic Anti-CD40 Induces Thyrocyte Proliferation and Promotes Thyroid Autoimmunity by Increasing CD40 Expression on Thyroid Epithelial Cells. *J Immunol.* In press.

Presentations - Yu

Yu. S. "CD8+ T cells induce thyroid epithelial cell hyperplasia and fibrosis". At the Dental School, Birth Defects Center, University of Louisville. (03/22/2010).

Yu S. "Regulation of IL-17 and GM-CSF production by immunomodulator", at the Department of Neuropathology and Developmental Sciences, University of Arkansas Medical School, Little Rock, AR. (10/18/2011).

Grants - Yu

NIH Exploratory/Developmental Research Grant (R21). Dr. Carole Cramer (PI)
08/15/12-02/15/15 RTB-mediated delivery: Orchestrating antigen trafficking to enhance cell immunity
Co-PI (Yu)

NSF Dr. Carole Cramer (PI) 01/15/10-MRI-R2 acquisition of equipment for investigating biodynamic interactions. Co-PI (S. Yu, R. Buchanan, M. Dolan, and M. Srivatsan)

Arkansas IDEa Networks of Biomedical Research Excellence (INBRE). Summer outreach Program. Yu (PI)
05/15/10-08/03/10.

Arkansas IDEa Networks of Biomedical Research Excellence (INBRE). Summer outreach Program. Yu (PI).
05/15/11-08/03/11.

Guolei (Jason) Zhou, Assistant Professor of Cell Biology

Publications - Zhou

Zhang H., Ghai P., Wang C., Field J. & Zhou G.L. Mammalian CAP1 (adenylyl Cyclase-Associated Protein 1) regulates cofilin function, the actin cytoskeleton and cell adhesion. In revision for Journal of Biological Chemistry.

Presentations – Zhou

Zhou G.L. The 52nd American Society for Cell Biology Annual Meeting, San Francisco, CA (Poster) 12/16/2012 GSK3 Phosphorylates the Actin-Regulating Protein CAP1 (adenylyl Cyclase-Associated Protein 1).

Zhou G.L. The 52nd American Society for Cell Biology Annual Meeting, San Francisco, CA (Poster) 12/16/2012 Mammalian CAP1 (adenylyl Cyclase-Associated Protein 1) Regulates Cofilin Function, the Actin Cytoskeleton and Cell Adhesion.

Zhou G.L. The 50th ASCB Annual Meeting, Philadelphia, PA (Poster) 12/13/2010 Identification and Functional Analysis of Phosphorylation Sites on CAP1.

Zhou G.L. Dept. of Biology, Claflin University, Orangeburg, SC (Invited Seminar) 06/22/2010 Cell Signals That Regulates Both Cell Survival and the Actin Cytoskeleton/Motility – Perspective in Controlling Cancer Metastasis through Manipulating Signaling Pathways.

Zhou G.L. The 101st AACR Annual Meeting, Washington D.C. (Poster) 04/21/2010 Domains That Distinguish Akt1 from Akt2 in Cell Migration.

Zhou G.L. Dept. of Biol. Sciences, Arkansas State University, Jonesboro, AR (Invited Seminar) 03/12/2010. Deregulation of Cell signaling that controls both Actin Cytoskeleton and Cell Survival: Implications in Cancer Therapeutics.

Grants – Zhou

Zhou G.L. Arkansas Breast Cancer Research Program (ABCRP) Research Grant (7/1/2012-6/30/2013; direct cost: \$75,000). Deregulation of the Actin-Regulating Protein CAP1 in the Invasiveness of Breast Cancer

Zhou G.L. NIH INBRE (Partnership for Biomedical Research in Arkansas) (5/15/2012-12/31/2012; direct cost: \$5,000)

maintains an active role in service to the Department, University, and larger community. Tables 6 and 7 detail the faculty's committee assignments

Departmental Committees

	Marty	Class Evaluation Committee			Grippio	Rich	Faculty Grievance Committee		2011-2014
	Julie	Class Evaluation Committee			Gilmore	David	Faculty Grievance Committee		2010-2013
	Ron	Class Evaluation Committee			Johnson	Ron	Faculty Grievance Committee		2010-2013
	Kaylynne	Class Evaluation Committee		Chair	Grippio	Anne	Faculty Grievance Committee		2010-2013
t		Grad Student Rep 2012-2013			Farris	Jerry	Faculty Grievance Committee		2010-2013
	Jerry	Bio of Animals Lab Coordinator	Chair		Medina-Bolivar	Fabricio	Faculty Senate		2013
	Tracy	Bio of Animals Lab Coordinator		2012+					
					Huggins	Julie	A & P Lab Coordinator		
	Anne	Bio of Cell Lab Coordinator							
					Bennett	Bob	Non Majors Bi Sci Committee	Chair	
					Klotz	Tracy	Non Majors Bi Sci Committee		
	Marty	Scholarship Committee	Chair	2009-2013	Huss	Marty	Non Majors Bi Sci Committee		
	Anne	Scholarship Committee			McKay	Tanja	Non Majors Bi Sci Committee		
	Ron	Scholarship Committee					Grad Student Rep 2011-2012		
	Bob	Scholarship Committee		Chair-elect					
					McKay	Tanja	PRT Committee	Chair	2012-2015
	Travis	Botany Program	Chair	2012+	Johnson	Ron	PRT Committee		2008-2014
	Bob	Botany Program			Grippio	Anne	PRT Committee		2012-2015

Marty	Botany Program			Risch	Tom	PRT Committee		officio
Fabricio	Botany Program			Medina-Bolivar	Fabricio	PRT Committee		2010-2013
				Huss	Marty	PRT Committee		2010-2013
Stan	Graduate Program Committee	Chair	2011-2014	Cramer	Carole	PRT Committee		2011-2014
Malathi	Graduate Program Committee		2011-2014					
Paul	Graduate Program Committee		2012-2015	Grippio	Rich	Recruitment Committee	Chair	2011+
Tanja	Graduate Program Committee		2010-2013	Parr	Rebecca	Recruitment Committee		
Fabricio	Graduate Program Committee		2010-2013	Medina-Bolivar	Fabricio	Recruitment Committee		
Jennifer	Graduate Program Committee		2010-2013	Glover	Kaylynne	Recruitment Committee		
						Grad Student Rep 2011-2012		
Malathi	Diversity Committee	Chair	2011+	Johnson	Ron	Departmental Safety Committee	Chair	
Jason	Diversity Committee			Klotz	Tracy	Departmental Safety Committee		
Carole	Diversity Committee			Gilmore	David	Departmental Safety Committee		
Julie	Diversity Committee			Huggins	Julie	Departmental Safety Committee		
Jerry	Diversity Committee							
				McKay	Tanja	Library Resource Coordinator		
Rich	Awards Committee	Chair						
Bob	Awards Committee							
Jason	Awards Committee			Risch	Tom	Alumni Outreach Committee	Chair	
Virginie	Awards Committee			Grippio	Anne	Alumni Outreach Committee		

					McKay	Tanja	Alumni Outreach Committee		
	Marty	Bio of Plants Lab Coordinator			Huggins	Julie	Alumni Outreach Committee		
	Bob	Bio of Plants Lab Coordinator							
	Travis	Bio of Plants Lab Coordinator			Grippio	Anne	Assessment Committee		
					Bennett	Bob	Assessment Committee	Chair	
	Tracy	Biol Non Majors Lab Coordinator			Glover	Kaylynne	Assessment Committee		
					McKay	Tanja	Assessment Committee		
	Tracy	Field Equipment Security Committee	Chair		Srivatsan	Malathi	Assessment Committee		
	Stan	Field Equipment Security Committee			Parr	Rebecca	Assessment Committee		
	Rich	Field Equipment Security Committee			Risch	Tom	Assessment Committee		
	Tom	Field Equipment Security Committee			Gilmore	Dave	Assessment Committee		
	Dave	Curriculum Committee	Chair	2012-2015					
	Bob	Curriculum Committee		2010-2013					
	Anne	Curriculum Committee		2010-2013					
	Malathi	Curriculum Committee		2011-2014					
	Kaylynne	Curriculum Committee		2011-2014					

Table 7 University / College Committees	
Retention Committee	Julie Huggins
Handbook Committee	Bob Bennett
IACUC	Malathi Srivatsan, Chair
IACUC	Rich Grippo
Admissions and Credits	Ron Johnson
General Education	Tanja McKay
Centennial Committee	Stan Trauth
University Honors Committee	Anne Grippo
IBC	Fabricio Medina-Bolivar
IBC	Dave Gilmore
IBC	Travis Marsico
ORTT	Malathi Srivatsan
HLC reaccreditation Committee	Rich Grippo
Undergraduate Curriculum Council	Dave Gilmore
PRT - CSM and University	Ron Johnson
Graduate Council	Malathi Srivatsan
Graduate Council	Tom Risch, Chair
ACE (university advising)	Dave Gilmore
Museum Advisory Board	Tom Risch
CSM Grievance Committee	Jennifer Bouldin
STEM Den advisory	Rich Grippo
STEM Den advisory	Paul Sikkell
MBS Program Committee	Malathi Srivatsan, Chair
MBS Program Committee	Fabricio Medina-Bolivar
MBS Program Committee	Tanja McKay
MBS Program Committee	Maureen Dolan
MBS Program Committee	Travis Marsico
Pre-professional committee	Anne Grippo
Pre-professional committee	Ron Johnson
Pre-professional committee	Malathi Srivatsan
College Assessment Committee	Anne Grippo

Assessment

All classes are assessed with a student survey (Appendix 3) and these results are reviewed by the Chair. Additionally, pre and post assessment data are collected for many of our classes and these results are entered into a Tracdat data base and submitted to the University's assessment office. We have an active departmental assessment committee that meets up to 10 times a semester. This group has developed a curriculum map for each of departmental majors and emphases areas (appendix 4).

Library Resources

The department of Biological Sciences is given a yearly allowance for library resources. The limited nature of the funding, results in inadequate online access as our research mission increases in size and scope.

Table 8. Biological Journals available through ASU Dean Ellis Library

Serial Title		Vendor	Your Most Recent Price	Format
Databases				
BIOLOGICAL ABSTRACTS		EBSCO	\$29,169	Online
ScienceDirect (shared with ABI, Agriculture, Chemistry, EVS, Library)		Elsevier	\$8,000	Online
WEB OF SCIENCE (share with Agriculture)		Thomson Reuters	\$17,428	Online
			\$54,597	
Journals				
American Journal of Botany		EBSCO	\$695	Print + Online
American Midland Naturalist		EBSCO	\$97	Print
American Naturalist		EBSCO	\$511	Online
American Naturalist Supplement		EBSCO	\$0	Online
Annals of the Entomological Society of America		EBSCO	\$355	Print
Annals of the Missouri Botanical Garden		EBSCO	\$185	Print
Annual Review of Ecology Evolution and Systematics		EBSCO	\$223	Print
Archives of Environmental Contamination & Toxicology		EBSCO	\$1,887	Print + Online
Audubon		EBSCO	\$38	Print
AUK		EBSCO	\$303	Online
Behavioral Ecology		EBSCO	\$858	Online
Biometrics		EBSCO	\$426	Online
Bioscience		EBSCO	\$497	Online
Botanical Review		EBSCO	\$254	Print + Online
Botany		EBSCO	\$1,275	Online
Bulletin of Environmental Contamination and Toxicology		EBSCO	\$1,769	Print + Online
Canadian Entomologist		EBSCO	\$309	Print

Table 8. Biological Journals available through ASU Dean Ellis Library				
Canadian Journal of Fisheries and Aquatic Sciences		EBSCO	\$1,315	Online
Canadian Journal of Zoology = Revue Canadienne de Zoologie		EBSCO	\$1,399	Online
Condor		EBSCO	\$275	Print + Online
Copeia		EBSCO	\$212	Print + Online
Ecological Applications		EBSCO	\$385	Print + Online
Ecological Entomology		EBSCO	\$1,920	Online
Ecological Monographs		EBSCO	\$207	Print + Online
Ecology - NY		EBSCO	\$942	Print + Online
Economic Botany		EBSCO	\$246	Print + Online
Environmental Entomology		EBSCO	\$381	Print
Evolution - KS		EBSCO	\$921	Print + Online
Freshwater Biology		EBSCO	\$6,279	Online
Freshwater Science		EBSCO	\$187	Print
Genetics		EBSCO	\$0	Online
Genome		EBSCO	\$825	Online
Herpetological Bulletin		EBSCO	\$0	Print + Online
Herpetological Bulletin		EBSCO	\$0	Print + Online
Herpetological Journal		EBSCO	\$140	Print + Online
Herpetological Journal		EBSCO	\$140	Print + Online
Herpetological Review		EBSCO	\$0	Print
Insect Conservation and Diversity		EBSCO	\$0	Online
Integrative and Comparative Biology		EBSCO	\$673	Online
Invertebrate Biology		EBSCO	\$285	Online
Journal of Cell Biology		EBSCO	\$4,505	Print + Online
Journal of Economic Entomology		EBSCO	\$444	Print
Journal of Field Ornithology		EBSCO	\$367	Online
Journal of Fish Biology		EBSCO	\$4,392	Online
Journal of Heredity		EBSCO	\$406	Online
Journal of Herpetology		EBSCO	\$0	Membership Title
Journal of Mammalogy		EBSCO	\$314	Print + Online
Journal of Marine Research		EBSCO	\$0	Print + Online
Journal of Marine Research		EBSCO	\$172	Online
Journal of the North American Benthological Society		EBSCO	\$0	Print
Journal of Wildlife Diseases		EBSCO	\$292	Print
Journal of Wildlife Management		EBSCO	\$971	Print + Online
Journal of Zoology		EBSCO	\$2,893	Print + Online
Limnology & Oceanography		EBSCO	\$875	Online
Limnology & Oceanography: Methods		EBSCO	\$0	Online
Limnology and Oceanography Bulletin		EBSCO	\$0	Online
Mammal Review		EBSCO	\$842	Online
Mammalia		EBSCO	\$374	Print
Migrant		EBSCO	\$0	Membership Title

Mycologia		EBSCO	\$354	Print + Online
National Wildlife		EBSCO	\$30	Print
North American Birds		EBSCO	\$72	Print
Novon		EBSCO	\$0	Print
Oikos - England		EBSCO	\$1,559	Online
Ornithological Monographs		EBSCO	\$0	Online
Plant and Cell Physiology		EBSCO	\$912	Online
Plant Science Bulletin		EBSCO	\$0	Print
Quarterly Review of Biology		EBSCO	\$312	Print
Society for the Study of Amphibians & Reptiles Basic Institutional Membership		EBSCO	\$207	Print
Southwestern Naturalist		EBSCO	\$72	Print
Systematic Biology		EBSCO	\$235	Online
Systematic Botany		EBSCO	\$227	Print + Online
Tennessee Ornithological Society Membership		EBSCO	\$37	Membership
Wetlands : Journal of Society of Wetland Scientists		EBSCO	\$383	Online
Wildlife Monographs		EBSCO	\$0	Print
Wildlife Monographs		EBSCO	\$0	Online
Wilson Journal of Ornithology		EBSCO	\$52	Print
Cell		Elsevier	\$2,133	Online
Plant Science		Elsevier	\$5,781	Online
			\$55,626	
Standing Orders				
Annual Review of Entomology			\$253	Print
Annual Review of Genetics			\$253	Print
Annual Review of Microbiology			\$253	Print
Annual Review of Physiology			\$277	Print
Annual Review of Plant Biology			\$277	Print
			\$1,400	
Total			\$111,623	

With our new allocation for the fall of 2013, we have added the following titles: Global Change Biology, Marine Ecology Progress Series, Journal of Animal Ecology, Journal of Applied Ecology, Wildlife Research, Conservation Biology, Ibis, Journal of Avian Biology, Applied and Environmental Microbiology, Eukaryotic Cell, Infection and Immunity, Journal of Bacteriology, Journal of Virology, mBio, Microbiology and Molecular Biology Reviews, and Molecular and Cellular Biology.

Departmental Facilities

The Department of Biological Sciences is housed primarily in the Laboratory Sciences Complex in both the east (LSE) and west wings (LSE). Additionally, Drs. Cramer, Dolan, Marsico, Medina-Bolivar, Srivatsan, Yu, and Zhou have lab and/or office space at the Arkansas Biosciences Institute (ABI). Departmental Space by PI is listed in table 9.

Table 9. Departmental Space as Assigned.

Rm Number	Usage	PI
LSE 101	File/ office supply Closet	Dept
LSE 113	Aquatic Biology Research Lab	Grippo
LSE 119	McDaniel Research Library	Dept
LSW 139 - 146	Electron Microscopy	Trauth
LSE201	Main Office	Dept
LSE202	Main Office	Dept
LSE203	Computer Lab	Dept
LSE204	Small Lecture	Dept
LSE207	Small Lecture	Dept
LSE301	Invert Research	McKay
LSE302	Multiuse Molecular Research	Gilmore/McKay/Parr
LSE303	research Lab	Farris
LSE304	Grad Student Research and Office	Risch
LSE305	Grad Student Research and Office	Risch/Rolland
LSE313	Office	Vacant
LSE314	Office	Rolland
LSE315	Office	McKay
LSE316	Office	Grippo
LSE317	Office	Huss
LSE318	Office	Harding
LSE319	Office	Huss
LSE320	Office	Parr
LSE321	Office	Johnson
LSE323	Freezer Room and Work area	Dept/Klotz
LSW330A	Office	Bennett

Table 9. Departmental Space as assigned.		
LSW330C	Office	A. Grippo
LSW339	cellular research lab	A. Grippo
LSW341	General Biology Labs	Dept.
LSW342	General Biology Lab Prep	Harding
LSW343	General Biology Labs	Dept.
LSE403	Teaching Lab	Dept.
LSE404	Teaching Lab	Dept.
LSE405	Molecular research Lab	Johnson/Marsico
LSE406	Herbarium	Dept./Marsico
LSE411	Aquatic Research	Sikkel
LSE412	Office	Sikkel
LSE413	Office	Farris
LSE414	Office	Marsico
LSE415	Office	Dianne
LSE416	Grad Student Research and Office	
LSE417	Grad Student Research and Office	
LSE418	Office	Gilmore
LSW430	research Lab	Srivatsian
LSW433	Anatomy and Physiology Lab	Dept.
LSW434	Cell Biology and Genetics Lab	Dept.
LSW437	Conference/ Small Class Room	Dept.
LSW438	Necropsy	Dept./Klotz
LSW439	Mammal Range/Museum	Dept./Klotz
LSW440	Herp Range	Dept./Trauth
LSW441	Zoology Lab	Dept.
LSW442	Botany Lab	Dept.
LSW443	Grad Student Research and Office	
LSW444	Large Lecture Classroom	Dept.
LSW545	Biotechnology Lab	Dept./Parr
LSW546	Microbiology Lab	Dept./Gilmore/Huggins
LSW547	Office	Srivatsian
LSW550	Office	Huggins

Departmental Capital Assets

Capital Assets, defined as an item with a purchase value of greater than \$2,500, represent teaching and research equipment used by the departments. A list of our capital assets and location is given in table 10.

Table 10. Capital Assets of the Department of Biological Sciences

DESCRIPTION	Location	Notes
MCS MEA60-BCE Comp 60 Ch MEA sys - invE Blan	ABI 231	
MCS MEA60-BCE Comp 60 Ch MEA sys - invE Blan	ABI 231	
Confocal Lifetime Imaging Microscope	ABI 231	
Confocal Lifetime Imaging Microscope	ABI 231	
Alba Brand A461 Laser Laucher Unit for Laser Diodes	ABI 231	
Alba Brand A461 Laser Laucher Unit for Laser Diodes	ABI 231	
Alba Brand A461 Laser Laucher Unit for Laser Diodes	ABI 231	
Alba Brand A461 Laser Laucher Unit for Laser Diodes	ABI 231	
Invertoskop 40 C	ABI 251	
Accuspin Refrigerated Micro-Centrifuge	ABI 252	
Accuspin Refrigerated Micro-Centrifuge	ABI 252	
IH-0400 Mouse/Rat Spinal Cord Impactor	ABI 252	moved to the animal facility in ABI
Biostation IM-II	ABI 252	
Veriti 96 Well Thermal Cycler	ABI 253	
Computer, Apple Power Mac G4	ABI 262	cpu only
Refrigerator - Chromatography 45.4 cu ft.	ABI 262	
CFX96 Real-Time PCR Detection System	ABI 334	
Electrochemical Detector for HPLC	ABI 335	
Microplate Reader, Model 680, Polarstar	ABI 353	
Conductivity Meter, Accumet 50 Ph/Ion	LSE 113	

Table 10. Capital Assets of the Department of Biological Sciences		
Digital Pump, Masterflex L/S	LSE 113	
Velocity Meter, Flo-Mate 2000-11	LSE 113	
Geoexplorer 3c 2 Pack	LSE 202	
Geoexplorer 3	LSE 202	
Hitachi Projector	LSE 219	
Hitachi Projector	LSE 219	
Stereo Microscope,Apo Sv 11	LSE 301	moved to Animal Care Facility 261
Microscope, Nikon	LSE 301	
Geolyte HI-MAG Video Imaging System	LSE 301	moved to Animal Care Facility 261
Isoelectric Focusing & Electrophoresis	LSE 302	
Purification System, Barnstead Nanopure	LSE 302	filters need replaced
Spectrophotometer, Helios Delta	LSE 302	
Sterilizer Branstead Ser C5366	LSE 303	currently not working
Trx-1000s Receiver (218-219 Mhz)	LSE 304	
Fieldcam, Sony Ldtlv/Boq	LSE 305 A	missing tag
Fieldcam, Sony Lctlv, Time Lapse	LSE 305 A	missing tag
Spotting Scope, Questar Field Model	LSE 313	moved to LSE 303A
Flow Hood, Vf-10166 Laminar	LSE 319	missing tag
Scotsman Flaker Ice Machine W/Bin, Sn 22	LSE 323	
Freezer,Sel-85 Chest Type	LSE 323	compressor not working
Projector, Infocus Lp650	LSE 403	
Vacuum Evaporator, Jee-4x	LSW 139	
Dryer, Sandri Critical Point	LSW 139	
Electron Microscope, Jem-100cx Temscan	LSW 141	
Microscope, Reichert -Jung, Microstar Iv	LSW 144	
Camera,Reichert-Jung , 35mm System.	LSW 144	
Electron Microscope, Arkay, Plate-Film	LSW 145	

Table 10. Capital Assets of the Department of Biological Sciences		
Ladd Research 3.0mm Diamond Knife	LSW 145	
Autosamdri - 815 Critical Point Dryer	LSW 146	
Autosamdri - 815 Critical Point Dryer	LSW 146	
Reliance 650 Washer, Sn 9472	LSW 269	
Third Lung, Brownies Hooka System Ctd 390	LSW 269	moved to Feed Mill and Hay Barn
Navcor V "Trooper" 5 Channel Gps Receive	LSW 300 A	
Computer,Pentium Pro 200	LSW 330	
Gps Base Station	LSW 330 A	
Safety Cabinet, Fisher Class li 056831	LSW 338	wrong inventory tag
Microscope, Main Bod Y Tms100	LSW 338	
Incubator, Napco Series 6001	LSW 338	
Projector, Nec Mt 850	LSW 341	replaced with Dell projector
Projector, Infocus Lp 650 Dlp	LSW 343	
Laminar Workstation, Thermo Forma	LSW 430	
Refrigerator, Thermo Forma Chromaography	LSW 430	
Filtered Chamber, Thermo Forma Single	LSW 430	
Centrifuge, Thermo Forma Model 5532	LSW 430	
Digital Camera, Pixelfly Monochrome	LSW 430	
Microplate Reader,Bio Rad 680	LSW 430	
Microscope, duel port	LSW 430	
Scepter Handheld Cell Counter	LSW 430	
Centriguge, Hermle Refrigerated	LSW 434	
Incubator, Napco Series 6001 Co2	LSW 434	
4-Module Deionizatio N System,Barnstead	LSW 434 A	
Eng Geo Explorer 3	LSW 440	
Geoexploer 3, W/Pathfinder	LSW 440	

Table 10. Capital Assets of the Department of Biological Sciences		
Environmental Shaker Orbit, Bench Top	LSW 545	moved to LSE 302
Incubator/Shaker From Dept.Of Energy	LSW 545	moved to LSE 302
Zeiss Axiolab Phase Contrast Microscope,	LSW 545	moved to LSE 302
Synergy 2 SLFA Model	LSW 545	
Sorvall Refrigerated Centrifuge	LSW 545	no rotors & electrical wiring is cracked not usable as is
Steam Sterilizer, Gravity Controlled	LSW 546 B	parts wearing out frequently
Generator, Honda 5.0 Hp		
Portable Laboratory, Hach-Cell/700		in Ecotox
Water System, Milli-Q Type I		this one has been retired and a new one installed
Furnace, Thermolyne, Series 30400		in Ecotox facility
2.1GX0.1UG Ultra Micro Balance		in Ecotox facility
Dionex ASE 350 100ML Bundled Package		in Ecotox facility
240 External GC/MS System		in Ecotox facility
Boat, Alumacraft Tex 16 Foot		Evinrude motor 056611 SN G__619377, trailer perm lic AA562748
Isco Auto Water Samp Le Model 6700		
Isco Auto Water Samp Le Model 6700		
Isco Auto Water Sample - Model 6700		
Isco Auto Water Samp Le Model 6700		
Isco Auto Water Samp Le Model 6700		
Isco Auto Water Samp Le Model 6700		
Water Sampler, Isco Model 6700		
Flow Meter,Mdl.2000 Marsh-McBirney		
Water Measurement/ Data Collector, Ysi		
1999 Gmc Suburban, Sn Gnfk16r8xj495379		
Sunrise Reader 20-300		
Electrofischer, Sri Model 15-D,Sn 002069		
Rancher, Honda Fourtrax 4 X 4 Es		

Table 10. Capital Assets of the Department of Biological Sciences		
Yamaha Grizzly 660 4wd Atv		5X8 trailer
Atv, Kawasaki 4 X 4 Kvf360-A1		4X8 trailer
Boat Motor,		
2006 Honda TRX 3509 FE		
2007 Honda 420 FM ATV		
25 HP Yamaha Tiller		
Sea-Ark Camo 14ft Gun Boat		Yamaha motor model #25GSH, trailer perm lic AA727874
Custom Built Vivarium - J. Worlds		maintained by Reef Escapes LLC
Coral Reef Salt Water Aquarium		maintained by Dr. Trauth graduate students
2005 Dodge Dakota Quad Cab		
Dell PowerEdge T620 Server		moved to ABI 231
Copier, Toshiba Model Dp3580		

Departmental Field Stations

Since 2009 the department has acquired two field stations. Risch and R. Grippo currently hold an NSF planning grant to develop this resources. A brief description of the facilities including research directions follows.

George L. Harp Environmental Field Station

The Harp Field station, located 15 miles south of Yellville, AR on a 300 foot scenic bluff overlooking the 150 mile Buffalo National River (BNR), is near the abandoned mining town of Rush, AR. The Harp Station is one of three “Learning Centers” created under MOU agreements between the BNR, a unit of the National Park Service, and regional universities. The Harp Station is the eastern-most learning center and thus closest to ASU. This field station consists of a 3,000 ft² home with detached garage and a 25’ x 42’ shop building. It contains a fully operational kitchen, woodstove and fireplace and has been furnished with bunk beds to provide overnight accommodations for up to 24 people.

This station is used extensively by ASU faculty and students for class field trips (Mammalogy, Environmental Management, Plant Systematics, Issues in Human Ecology, Environmental Biology, and Dendrology. It is also used for both ASU and non-ASU research projects. On-going research projects include endangered bat surveys, Lepidopteran population dynamics, effects of abandoned zinc mines, and small mammal population ecology.

ASU faculty Tom Risch and Rich Grippo, using a National Science Foundation Field Station Planning Grant, hold stakeholder workshops and visit other regional, national and international field stations to enable development of a master plan for the Harp Field station to guide infrastructure funding requests from the NSF through the Improvements in Facilities, Communications, and Equipment at Biological Field Stations and Marine Laboratories (FSML) program.

The following are possible research areas that could be supported by the Harp Field Station with the synergistic combination of federal, state and university support. Left and right columns indicate complementary studies.

Restoration/sustainability of riparian ecosystems	Biodiversity conservation
Linear reserves/ habitat fragmentation	Upstream/ downstream linkages (River Continuum Concept)
River geomorphology	Karst systems (extensive limestone bedrock)
Forest restoration/management	Fire/ prescribed burning
Economic impacts of recreation on rural populations	Sociological concerns/ cultural impacts
Long Term Ecological Research site (LTER)	Climate change
Conservation in the face of agricultural impacts on tributaries	Agriculture on tribs in the face of downstream conservation
Air quality monitoring	Visibility change, acid rain, ozone, light pollution

The singly most promising research area for significant, large federal funding of the Harp Station is development as an LTER or similar site (NEON) because such sites address ecological issues that can last decades and span large geographical areas, such as the 860,000 ac. BNR watershed.

Non-research uses of the Harp Field Station could include conservation-themed corporate retreats, outreach to local and regional schools, summer ecology camps, and science-related continuing education workshops for school teachers

Bearitage Field Station

Located on ≈1,200 ac. 40 min. S. of ASU, Bearitage straddles the L'Anguille River and includes mature bottomland hardwood forest, Cropland Reserve Program (CRP) and Wetland Reserve Program (WRP) lands currently planted in native vegetation, moist soil units for waterfowl management, a restored marshland (Prairie Pothole Experimental Wetland), and 40 acres of cropland (currently soybeans). Most of the wetlands and forest tracts are bounded by maintained levees that permit water management and experimental manipulation. The property includes two homes and a large shop.

The recently deceased owner, Mr. Scott House, executed an agreement to bequeath this reserve to ASU for use in education and research stipulating continuation of management for waterfowl and permanent hunting rights for his family. Prior to his death Mr. House built a 1,200 ft² research center and dormitory classroom that can house eight for use by ASU faculty and students. Classes taught at the Bearitage Field Station include those mentioned above and a current research project includes mallard telemetry studies.

Possible research projects (left and right columns indicate complementary studies):

Comparison of wetland services provided by restored vs natural wetlands	Evaluation of upstream/downstream fish, invertebrate, bird, and plant diversity associated with management via CRP, WRP
Efficacy of pollution (sediment, bacteria) removal by restored wetlands	Effect of specific agricultural practices and BMPs on fish and wildlife populations in a bottomland ecosystem
Effect of micro-habitat on establishment and growth of “super tree” water oaks	Studies on wetland-associated wildlife including on AR Species of Conservation Concern Swainson’s Warbler, Rafinesque’s big-eared bat)
Utilization of the experimental “prairie pothole” tract by waterfowl and other wildlife	Study of alternative management approaches and their effects on vegetation and waterfowl populations
Economic effect of establishing a large wetland reserve in an rural farming community	Analysis of how to successfully incorporate hunting into farming operations to improve farm income

Note: This Station may be able to support significant match on future grant opportunities because maintenance and caretaker support from the trust could also count as in-kind donations.

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This station is used extensively by ASU faculty and students for class field trips (Mammalogy, Environmental Management, Plant Systematics, Issues in Human Ecology, Environmental Biology, and Dendrology. It is also used for both ASU and non-ASU research projects. On-going research projects include endangered bat surveys, Lepidopteran population dynamics, effects of abandoned zinc mines, and small mammal population ecology.

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Comparison of wetland services provided by restored vs natural wetlands	Evaluation of upstream/downstream fish, invertebrate, bird, and plant diversity associated with management via CRP, WRP
Efficacy of pollution (sediment, bacteria) removal by restored wetlands	Effect of specific agricultural practices and BMPs on fish and wildlife populations in a bottomland ecosystem
Effect of micro-habitat on establishment and growth of "super tree" water oaks	Studies on wetland-associated wildlife including on AR Species of Conservation Concern Swainson's Warbler, Rafinesque's big-eared bat)
Utilization of the experimental "prairie pothole" tract by waterfowl and other wildlife	Study of alternative management approaches and their effects on vegetation and waterfowl populations
Economic effect of establishing a large wetland reserve in an rural farming community	Analysis of how to successfully incorporate hunting into farming operations to improve farm income

Note: This Station may be able to support significant match on future grant opportunities because maintenance and caretaker support from the trust could also count as in-kind donations.

Appendix 1 – Classes

DEPARTMENT OF BIOLOGICAL SCIENCES

Biology (BIO)

BIO 1013. Making Connections Biology Required course for first semester freshmen. Core content includes transition to college, academic performance skills, problem solving, critical thinking, self management, group building skills, and university policies. Content related to the departmental majors is also included. Fall.

BIO 1201. Human Anatomy Laboratory Study of the structure of the human body with emphasis on the muscular, skeletal, nervous, and vascular systems. For Radiologic Technology Science majors only. Special course fees may apply. Two hours per week. It is recommended this course be taken concurrently with BIO 1203. Fall.

BIO 1203. Human Anatomy Study of the structure of the human body with emphasis on the muscular, skeletal, nervous, and vascular systems. For Radiologic Technology Science majors only. Three hours per week. Special course fees may apply. It is recommended this course be taken concurrently with BIO 1201. Fall.

BIO 1211. Human Physiology Laboratory Study of the function of the human body with emphasis on the muscular, skeletal, nervous, respiratory and vascular systems. For Clinical Laboratory Science associate degree majors only. Two hours per week. Special course fees may apply. To be taken concurrently with BIO 1213. Spring.

BIO 1213. Human Physiology Study of the function of the human body with emphasis on the muscular, skeletal, nervous, respiratory and vascular systems. For Clinical Laboratory Science associate degree majors only. Three hours per week. Special course fees may apply. It is recommended that this course be taken concurrently with BIO 1211. Spring.

BIO 1301. Biology of Animals Laboratory Two hours per week. Special course fees may apply. It is recommended this lab be taken concurrently with BIO 1303. Fall, Spring, Summer, even.

BIO 1303. Biology of Animals Fundamentals of modern zoology and a survey of the phyla. Lecture three hours per week. Special course fees may apply. Fall, Spring, Summer, even.

BIO 1501. Biology of Plants Laboratory Two hours per week. It is recommended that this lab be taken concurrently with BIO 1503. Special course fees may apply. Fall, Spring, Summer, odd.

BIO 1503. Biology of Plants Form, structure, function, and reproduction of plants. Lecture three hours per week. Special course fees may apply. Fall, Spring, Summer, odd.

BIO 2011. Biology of the Cell Laboratory Two hours per week. Recommended to be taken concurrently with BIO 2013. Special course fees may apply. Prerequisite, CHEM 1011.

BIO 2013. Biology of the Cell An introduction to structures and processes in cells, including cellular evolution, biologically important molecules, organelle structure and function, and cellular energy. Lecture three hours per week. Special course fees may apply. Prerequisite, CHEM 1013. Fall, Spring.

BIO 2101. Microbiology for Nursing and Allied Health Laboratory Two hours per week. It is recommended this course be taken concurrently with BIO 2103. Special course fee, 10.00. Fall, Spring, Summer.

BIO 2103. Microbiology for Nursing and Allied Health Bacteria, viruses, rickettsiae, chlamydiae, molds, yeasts, and protozoans as they relate to human health. Lecture three hours per week. Special course fees may apply. Fall, Spring, Summer.

BIO 2201. Human Anatomy and Physiology I Laboratory The behavior of matter with respect to life processes, cells, tissues, functional anatomy of integumentary, skeletal, muscular and nervous systems, cat anatomy, nerve and muscle preparations and recordings. Two hours per week. No prerequisites. Special course fees may apply. It is recommended this course be taken concurrently with BIO 2203. Fall, Spring, Summer.

BIO 2203. Human Anatomy and Physiology I Introduction to atoms, molecules, the biology of organelles and cellular functions, tissues, functional anatomy of integumentary, skeletal, muscular and central nervous systems and interaction with the external environment. Three hours per week. Special course fees may apply. No prerequisites. Fall, Spring, Summer.

BIO 2221. Human Anatomy and Physiology II Laboratory Major sense organs, autonomic nervous system and internal environment, neuro-endocrine control mechanisms, respiratory and cardiovascular functions, oxygen and carbon dioxide transport, liver functions, digestive, renal and reproductive processes. Two hours per week. Special course fees may apply. Prerequisites, BIO 2201 and BIO 2203. It is recommended this course be taken concurrently with BIO 2223. Fall, Spring, Summer.

BIO 2223. Human Anatomy and Physiology II Major sense organs, autonomic nervous system and internal environment, neuro-endocrine control mechanisms, respiratory and cardiovascular functions, oxygen and carbon dioxide transport, liver functions, digestive, renal and reproductive processes. Three hours per week. Special course fees may apply. It is recommended this course be taken concurrently with BIO 2221. Fall, Spring, Summer.

BIO 3011. Genetics Laboratory DNA observation, DNA isolation, heredity and variation with applications to bacteria, plants and animals will be investigated in the laboratory. Three hours per week. It is recommended this course be taken concurrently with BIO 3013. Special course fees may apply. Fall, Spring.

BIO 3013. Genetics A study of the principles of heredity including Mendelian genetics, population and evolutionary genetics, and molecular genetics with a focus on patterns of human inheritance. Special course fees may apply. Prerequisites, BIO 2013 and BIO 2011. Fall, Spring.

BIO 3023. Principles of Ecology An introduction to the study of relationships and interactions of organisms and their environment. Special course fees may apply. Prerequisites, BIO 1501, BIO 1503, BIO 1301, and BIO 1303. Fall, Spring.

BIO 3033. Evolution A critical review of evolutionary principles, primarily the neo Darwinian theory, with comparisons to newly emerging theories. Lecture, selected readings, writings, and group discussions. Special course fees may apply. Prerequisites, BIOL 1001 and 1003 or higher. Spring, odd.

BIO 3051. Try Out the Classroom Introductory classroom experience led by ASU STEM faculty and area teachers. Topics include Arkansas science/math curriculum, classroom management, laboratory safety, and basic teaching skills. Students will develop and present science/math activities in area classrooms and campus outreach. Prerequisites, 8 BIO credit hours. Fall.

BIO 3201. Introduction to Medical and Dental Practices This course introduces students to the diversity of specialty practices within the fields of medicine and dentistry. Prerequisites, BIOL 1013, BIOL 1021, BIO 1203, and BIO 1201. Enrollment limited to students seeking a career in dentistry, medicine, podiatry, or optometry. Graded pass or fail, credit cannot be applied to degree requirements. Special course fees may apply. Spring.

BIO 3203. Pathophysiology The physiology of pathological disturbances and inborn errors. Mechanism of disturbance, body compensating efforts, and adaptive responses of humans. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 2223 and BIO 2221, OR BIO 3233 and BIO 3231. Fall, Spring.

BIO 3211. Techniques for Medical Exam Test Taking This course introduces students to the Medical College Aptitude Test, MCAT. Basic scientific principles and test taking strategies within the fields of medicine will be covered. Prerequisites, enrollment limited to students seeking a career in medicine. Graded pass or fail, credit cannot be applied to degree requirements. Spring.524

BIO 3221. Human Structure and Function I Laboratory Two hours per week. Special course fees may apply. Special course fees may apply. It is recommended this course be taken concurrently with BIO 3223. Fall.

BIO 3223. Human Structure and Function I This course covers the structure and function of the human organism. Topics covered include, cellular function, skeletal, muscular and nervous systems. Special course fees may apply. Prerequisite, BIO 1301, BIO 1303, CHEM 1023 and 1021. Fall.

BIO 3231. Human Structure and Function II Laboratory Two hours per week. Special course fees may apply. It is recommended this course be taken concurrently with BIO 3233. Spring.

BIO 3233. Human Structure and Function II This course covers the structure and function of the human organism. Topics covered include special senses and endocrine, respiratory, cardiovascular, digestive, urinary, reproductive and integumentary systems. Special course fees may apply. Prerequisites, BIO 3223 and BIO 3221. Spring.

BIO 3241. Physical Diagnosis This course provides an introduction to clinical medicine for Pre medical students by teaching the basics of physical examination. Prerequisite, BIO 1303 and BIO 1301. Enrollment limited to Pre medical students. Special course fees may apply. Graded pass or fail, credit cannot be applied to degree requirements. Fall.

BIO 3251. Introduction to Pathology This course introduces Pre medical students to presentation, physical findings, etiology and basic treatment of a number of common diseases and conditions. Special course fees may apply. Prerequisite, BIO 1303 and BIO 1301. Enrollment limited to Pre medical students. Graded pass or fail, credit cannot be applied to degree requirements. Spring.

BIO 3301. General Entomology Laboratory Two hours per week. It is recommended this course be taken concurrently with BIO 3303. Special course fees may apply. Fall.

BIO 3302. Comparative Anatomy Chordate morphology, phylogeny, ontogeny, organology, and homology. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, odd.

BIO 3303. General Entomology Identification, structure, and life history of the principal insect orders. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall.

BIO 3311. Economic Entomology Laboratory Two hours per week. It is recommended this course be taken concurrently with BIO 3313. Special course fees may apply. Spring.

BIO 3312. Comparative Anatomy Laboratory Four hours per week. Special course fees may apply. To be taken concurrently with BIO 3302. Fall, odd.

BIO 3313. Economic Entomology Life history, distribution, and control of injurious insects. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring.

BIO 3321. Animal Physiology Laboratory Three hours per week. Special course fees may apply. To be taken concurrently with BIO 3323. Spring.

BIO 3322. Invertebrate Zoology Classification and natural history of representative invertebrates. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring, even.

BIO 3323. Animal Physiology Chemical, physical, and biological functions of systems, including the study of metabolism and inter relationships of organ systems to the entire organism. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301, BIO 1303, CHEM 1021, and 1023. Spring.

BIO 3332. Invertebrate Zoology Laboratory Four hours per week. Special course fees may apply. To be taken concurrently with BIO 3322. Spring, even.

BIO 3501. Wild Flowers of Arkansas Identification and conservation of wild flowers in Arkansas, plus studying those that are edible, endangered or rare, poisonous, or may be used in flower gardens. Lecture one hour per week. Open to all majors. Special course fees may apply. Summer, odd every 4 years.

BIO 3511. Wild Flowers of Arkansas Laboratory Two hours per week. To be taken concurrently with BIO 3501. Special course fees may apply. Summer, odd every 4 years.

BIO 3541. Plant Pathology Laboratory Two hours per week. To be taken concurrently with BIO 3542. Special course fees may apply. Spring, odd.

BIO 3542. Plant Pathology Nature, cause, and control of diseases of orchard, garden, and field crops. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1501 and BIO 1503. Spring, odd.

BIO 3553. Economic Botany Economic plants and their use by man. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1501 and BIO 1503. Summer, even every 4 years.

BIO 4001. Laboratory Techniques in Electron Microscopy An introduction to the preparation of biological materials for viewing with the transmission and scanning electron microscope. Emphasis will be placed on preparative techniques that are commonly used in the laboratory. Lecture one hour per week. Special course fees may apply. Prerequisite, eight hours upper-level biology. Instructor permission required. Fall, even.

BIO 4003. Laboratory Techniques in Electron Microscopy Laboratory Six hours per week. To be taken concurrently with BIO 4001. Special course fees may apply. Fall, even.

BIO 4011. Microtechnique Methods of killing, fixing, staining, and mounting tissues. Lecture one hour per week. Special course fees may apply. Prerequisites, BIO 1501, BIO 1503, CHEM 3103, and CHEM 3101. Fall, odd.

BIO 4012. Microtechnique Laboratory Four hours per week. To be taken concurrently with BIO 4011. Special course fees may apply. Fall, odd.

BIO 4013. Population Genetics This course will investigate the theories describing the temporal nature of the genetic structure of populations. There will be an emphasis on problem solving applying statistical tools. Intended for students entering the disciplines of systematics, conservation, agriculture, and wildlife and fisheries sciences. Special course fees may apply. Fall, even years.

BIO 4021. Biological Seminar Conferences, readings, and reports on material relevant to the biological sciences. Required of all department majors. Open only to biology department majors with 16 hours or more of course work in the subject area. Special course fees may apply. Fall, Spring, Summer.

BIO 4023. History of Biological Ideas This course analyzes the history of biological ideas such as evolution, heredity, spontaneous generation, and molecular biology, aimed at a better understanding not only of the historical background of current research but also on how science proceeds. Special course fees may apply. Prerequisites will be at least two of the following courses, BIO 3033, BIO 3023, and BIO 3013. Permission of Instructor required. Fall, odd.

BIO 403V. Special Problems in Biology Specific area with the topic and mode of inquiry agreed upon by student and instructor. Registration may be repeated with various topics. Registration must be approved by the program director. Special course fees may apply. Demand.

BIO 404V. Special Topics in Biological Sciences Topical or technique driven seminar relating to the biological sciences that will lead to the training of students in a body of work, such as newly developed research technique and approach. Number of credit hours will vary. Special course fees may apply. Permission of Instructor required. May be repeated for a total credit of 6 hours. Fall, Spring.

BIO 4103. Virology The structure, function, and classification of viruses, and their impact on modern society and the biological world. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 2103 or BIO 3013 or BIO 4104 or BIO 4133. Fall, even. 525 526

BIO 4104. Microbiology Morphology, physiology, taxonomy and cultivation of bacteria, viruses, fungi, and protozoans with an emphasis on medically relevant bacteria. Relationship of microorganisms to animals, plants, and the environment. Lecture two hours per week and laboratory four hours per week. Prerequisites, CHEM 1023 and BIO 2013 or permission of instructor. Special course fees may apply. Fall, Spring, Summer, even.

BIO 4111. Immunology Laboratory Study of classical and current immunology techniques such as ELISA, immuno electrophoresis and Western Blot analysis. Laboratory 3 hours per week. Special course fees may apply. Prerequisites, BIO 2013 and CHEM 1013. Fall.

BIO 4113. Immunology Study of the human immune system. Topics include innate and acquired immunity, complement fixation and disorders of the immune system. Lecture 3 hours per week. Special course fees may apply. Prerequisites, BIO 2013 and CHEM 1013. Fall.

BIO 4123. Cell Signaling This course will provide an understanding of key concepts about cellular signaling mechanisms, major signaling pathways identified to date, and about the methods used to study these pathways. Three hours per week during spring semester. Special course fees may apply. Prerequisites, BIO 2013 or BIO 4133, or permission of the instructor. Spring, odd.

BIO 4131. Cell Biology Lab Two hours per week. To be taken concurrently with BIO 4133. Special course fees may apply. Spring.

BIO 4133. Cell Biology Organization and activities of cells, with emphasis on the ultrastructure and function of cellular organelles. Lecture three hours per week. Special course fees may apply. Prerequisites, CHEM 1023 and CHEM 1021. Spring.

BIO 4143. Pharmacology The study of drugs and their mechanisms of action at the system, cellular, and molecular levels. Special course fees may apply. Prerequisites, BIO 2203 and BIO 2223, or BIO 3223 and BIO 3233, BIO 4104, and CHEM 4243. Spring, even.

BIO 4201. Issues in Human Ecology Laboratory Two hours per week. To be taken concurrently with BIO 4202. Special course fees may apply. Summer, odd.

BIO 4202. Issues in Human Ecology A broad ecological approach demonstrating problems of modern society such as environmental deterioration, hunger, and resource depletion. Lecture two hours per week. Special course fees may apply. Summer, odd.

BIO 4211. Human Genetics Laboratory Three hours per week. To be taken concurrently with BIO 4213. Special course fees may apply. Fall, odd.

BIO 4213. Human Genetics Current advances in the understanding of the human genome. Lecture three hours per week. Prerequisite, BIO 3013. Special course fees may apply. Fall, odd.

BIO 4223. Human Endocrinology Control of physiological processes by hormones. Types of chemical messengers, impact on cells, tissues and organs, and interrelationships of organ systems with respect to hormones will be studied. Important endocrine disorders will also be addressed. Special course fees may apply. Prerequisites, BIO 2013 or CHEM 4243, AND BIO 2223 and BIO 2221 or BIO 3233 and BIO 3231. Spring.

BIO 4301. Aquatic Entomology Identification, life histories, and ecology of aquatic arthropods, with emphasis on freshwater insects. For students in wildlife management, fisheries management, aquatic biology, and advanced entomology. Lecture one hour per week. Special course fees may apply. Prerequisites, BIO 3301, BIO 3303, and BIO 3123 or BIO 4371 and BIO 4373. Spring, odd.

BIO 4302. Aquatic Entomology Laboratory Four hours per week. Special course fees may apply. To be taken concurrently with BIO 4301. Spring, odd.

BIO 4303. Forensic Entomology The life history, ecology and behavior of insects and related arthropods and how they affect the interpretation of potential crime scenes. Special course fees may apply. Prerequisites, BIO 2013 or BIO 1303. Dual listed BIO 5303. Fall, odd.

BIO 4311. Fishery Biology Identification, ecology, food habits, management, and behavior of fishes. Lecture one hour per week. Special course fees may apply. Prerequisites, BIO 1303 and BIO 1301. Summer, even.

BIO 4312. Fishery Biology Laboratory Four hours per week. To be taken concurrently with BIO 4311. Special course fees may apply. Summer, even.

BIO 4313. Biospeleology Life in Darkness This course analyzes the biology of organisms that live in hypogean subterranean environments, particularly in cave, phreatic, and karst habitats. That includes a survey of hypogean organisms, their evolution, ecology, and conservation biology. Special course fees may apply. Course prerequisites, at least two of the following, BIO 3033, BIO 3023, and BIO 3013, and permission of the instructor. Spring, even.

BIO 4322. Marine Mammals Laboratory Hands on experience on the classification, anatomy, and behavior of marine mammals. Concurrent enrollment in BIO 4323. Special course fees may apply. Permission of instructor required. Spring, odd.

BIO 4323. Biology of Marine Mammals This course analyzes the biology of marine mammals based on their adaptations to the aquatic environment from evolutionary, anatomical, physiological, and ecological perspectives. Special course fees may apply. Prerequisites will be at least two the following courses, BIO 3312, BIO 4352, BIO 4653, BIO 3023, or BIO 3033. Permission of Instructor required. Spring, odd.

BIO 4332. Animal Histology Cells and tissues of the organ systems of vertebrates. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 3302 and BIO 3312. Spring.

BIO 4333. Marine Biology Overview of the diverse discipline of marine biology. Emphasis on life history but will incorporate aspects of chemistry, microbiology, molecular biology, and ecology of marine systems. Also includes marine fisheries, conservation biology, aquaculture, pharmacology, resource management, and public policy. Special course fees may apply. Prerequisites, BIO 1303 and BIO 1301 or BIOL 1003 and 1001, and BIO 3023, or permission of instructor. Dual listed BIO 5333. Spring, even.

BIO 4341. Animal Embryology Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4343. Spring.

BIO 4342. Animal Histology Laboratory Four hours per week. Special course fees may apply. To be taken concurrently with BIO 4332. Spring.

BIO 4343. Animal Embryology Study of reproduction and development in animals including reproductive systems, gamete formation, fertilization, early cleavage, formation of germ layers, and development of the organ systems. Lecture three hours per week. Special course fees may apply. To be taken concurrently with BIO 4341. Prerequisites, BIO 1301 and BIO 1303. Spring.

BIO 4351. Mammology Laboratory Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4352. Fall, even.

BIO 4352. Mammology Classification, distribution, structure, ecology, adaptations, and economic importance of mammals. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, even.

BIO 4353. Field Techniques for Marine Mammals Field experience in describing and analyzing marine behavior of dolphins and other marine mammals. Special course fees may apply. Permission of Instructor required. Summer, odd.

BIO 4361. Mammalian Neurobiology Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4363. Fall, odd.

BIO 4362. Applied Aquaculture Field course in which principles of aquaculture are applied within several public and private enterprises. Intended for the student interested in wildlife, fisheries biology, and agriculture. Special course fees may apply. Prerequisites, BIO 4311 and BIO 4312. Summer.

BIO 4363. Mammalian Neurobiology A detailed study of the mammalian nervous system with particular emphasis on morphological aspects. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303, or BIO 2223 and BIO 2221, or permission of instructor. Fall, odd.

BIO 4371. Animal Ecology Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4373. Fall, odd. 527 528

BIO 4372. Applied Fisheries Field course in which principles are applied within several fisheries management settings. Intended for the Wildlife Ecology and Management major. Special course fees may apply. Prerequisite, BIO 4311. Summer.

BIO 4373. Animal Ecology The relationship of animals to their chemical, physical, and biological environment, and the distribution of animal life. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 3023. Fall, odd.

BIO 4382. Parasitology Parasites of vertebrates and plants, with emphasis on protozoan and helminth parasites of man and domestic animals. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring.

BIO 4392. Parasitology Laboratory Four hours per week. Special course fees may apply. To be taken concurrently with BIO 4382. Spring.

BIO 4401. Ichthyology Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4402. Fall, even.

BIO 4402. Ichthyology Taxonomy, distribution, natural history, and economic importance of fishes, with emphasis on Arkansas species. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, even.

BIO 4403. Comparative Vertebrate Reproduction This combined lecture and lab course surveys major events in the vertebrate reproductive cycles and patterns. Special course fees may apply. Prerequisites, BIO 3231 and BIO 3233, or BIO 3323 and 3321. Dual Listed BIO 5403. Fall even.

BIO 4411. Herpetology Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4412. Spring, even.

BIO 4412. Herpetology Collection, identification, classification, distribution, economic importance, and life histories of amphibians and reptiles, with emphasis on Arkansas species. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and 1303. Spring, even.

BIO 4413. Wildlife Program Internship Participation in a professional wildlife educational, management or research program activity. Internship is arranged by the student and may be a volunteer or paid position. Entails a minimum of 160 work hours. Special course fees may apply. Must be approved by advisor or chair. Fall, Spring, Summer.

BIO 4421. Ornithology Laboratory Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4423. Spring, even.

BIO 4423. Ornithology Morphology, physiology, taxonomy, behavior, ecology, natural history, zoogeography, and evolution of birds. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring, even.

BIO 4433. Field Experience in Marine Environments Hands on experience with living and non living components of environments. Emphasis on marine organisms and habitats but will incorporate human interactions associated with marine environments. Course is comprised of an intensive 12 day, 10 hours a day, field trip to an appropriate marine environment. Special course fees may apply. Prerequisites, BIO 4333, or BIOL 1003 and BIOL 1001, or permission of instructor.

BIO 4513. Plant Physiology General principles of conduction, cellular reactions, respiration, growth, photosynthesis, movement, hormones, and metabolism in plants. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1501, BIO 1503, and CHEM 2064 or 3103 and 3101. Spring, even.

BIO 4521. Wetland Plant Ecology Laboratory Two hours per week. To be taken concurrently with BIO 4522. Special course fees may apply. Spring, odd.

BIO 4522. Wetland Plant Ecology A study of plant responses to environmental factors during germination, growth, reproduction, and dormancy. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 3023 or permission of professor or chair. Spring, odd.

BIO 4541. Mycology Laboratory Two hours per week. To be taken concurrently with BIO 4542. Special course fees may apply. Fall, even every 4 years. Fall, odd.

BIO 4542. Mycology Morphology, cytology, genetics, and physiology of fungi. Lecture two hours per week. Four hours per week. To be taken concurrently with BIO 4541. Special course fees may apply. Fall, odd.

BIO 4551. Medical Mycology Laboratory Two hours per week. To be taken concurrently with BIO 4552. Special course fees may apply. Fall, even.

BIO 4552. Medical Mycology Cutaneous, systemic, and opportunistic fungus diseases mycoses of man and other animals. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1501 and BIO 1503. Fall, even.

BIO 4601. Limnology Laboratory Two hours per week. To be taken concurrently with BIO 4603. Special course fees may apply. Fall, odd.

BIO 4603. Limnology Physicochemical conditions of fresh water, and their effects on aquatic life, including plankton analysis and bottom fauna studies. Lecture three hours per week. Special course fees may apply. Prerequisite, BIO 1301 and BIO 1303. Fall, odd.

BIO 4611. Radiation Safety Theory and techniques for dealing with radiation and radioactive materials. Required for students wishing to use radioactive materials on campus. Permission of Instructor required. Special course fees may apply. Demand.

BIO 4612. Legal Aspects of Environmental Management Policy, law and regulations relating to society use, management and protection of natural resources. The course will present the differences and similarities between environmental regulation and previous social regulation, and examine the logic behind current regulatory programs. Special course fees may apply. Prerequisite, BIOL 1003 and BIOL 1001 or equivalent. Lecture two hours per week. Spring, even.

BIO 4613. Conservation Biology Study of global and local biological resources, including the diversity of life, the value of biodiversity, the importance of diversity to humans and human cultures, and interdisciplinary strategies to conserve biological resources. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 3023 or permission of instructor. Spring, odd.

BIO 4621. Environmental Microbiology Laboratory Laboratory and field investigation into the role of microbes in the environment. Two hours per week. To be taken concurrently with BIO 4623. Special course fees may apply. Spring, odd.

BIO 4623. Environmental Microbiology Study of the physiology and diversity of microorganisms and their role in cycling of nutrients and mineralization of pollutants in the world. Special course fees may apply. Prerequisites, CHEM 1023 and BIO 2013, or BIO 4104, or BIO 4133. Spring, odd.

BIO 4633. Environmental Toxicology Mechanisms and Impacts Understanding the basic principles behind the study of impacts and the mechanisms of physiological disturbances associated with environmental toxicant exposure to natural systems. Prerequisites, BIO 4133 and BIO 4131, or CHEM 4243 or permission of instructor. Lecture three hours per week. Special course fees may apply. Fall, even.

BIO 4641. Environmental Biology Laboratory Field and laboratory exposure to ecological, economic and sociological aspects of management of water, soil and air resources. Content will vary based on current topics of importance in the field of environmental science. Laboratory three hours per week. Prerequisites, BIO 3023 or BIO 4373, BIO 4633 or permission of instructor. To be taken concurrently with BIO 4643. Special course fees may apply. Fall, odd.

BIO 4643. Environmental Biology Exposure to ecological, economic and sociological aspects of management of water, soil and air resources. Content will vary based on current topics of importance in the field of environmental biology. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 3023 or BIO 4373, BIO 4633, or permission of instructor. Fall, odd.

BIO 4651. Wildlife Management Laboratory Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4653. Fall, even.

BIO 4653. Wildlife Management The ecology and management of wildlife species and their environment, with emphasis on fish, waterfowl, upland game birds, and mammals. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, even.

BIO 4661. Wildlife Management Investigational Techniques Laboratory Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4661. Spring, odd.

BIO 4663. Wildlife Management Investigational Techniques Identification of wildlife problems, project design, interpretation and construction of wildlife maps, food habit and census techniques, wildlife populations and habitat analyses, predictive population dynamics, and introduction to modeling and wildlife decision making procedures. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring, odd.

BIO 4673. Instruction to GIS for Natural Resources Introduction to the principles, theory, and practice of contemporary Geographic Information Systems for Natural Resources. Combination of lecture, reading, and computer based activity centered around natural resources will be used to provide background and understanding. Special course fees may apply. Prerequisites, BIO 3023 or consent of instructor. Fall.

BIO 4704. Plant Systematics A study of the systematics, nomenclature, morphology, and identification terminology for vascular plants with an emphasis on dichotomous key-based identification of flowering plants of Arkansas. Special course fees may apply. Prerequisites: Bio 1501, 1503. Spring.

BIO 4714. Dendrology A study of the systematics, nomenclature, morphology, phenology, geographic range, and natural history of woody plants with an emphasis on field recognition throughout the year. Dual listed with BIO 5714. Special course fees may apply. Prerequisites, BIO 1501 and BIO 1503. Fall, even.

Biology (BIOL)

BIOL 1001. Biological Science Laboratory Two hours per week. It is recommended this course be taken concurrently with BIOL 1003. Special course fees may apply. Fall, Spring, Summer.

BIOL 1003. Biological Science The major characteristics and processes of life emphasizing the human organism. Promotes understanding of diversity and unity among living organisms with focus on ecological interactions and responsibilities of people within their social and natural environment. Lecture three hours per week. Special course fees may apply. It is recommended that this course be taken concurrently with BIOL 1001. Fall, Spring, Summer.

BIOL 1033. Biology of Sex Biological basis of sex and reproduction with an emphasis on humans. Course will provide students with a basic functional understanding of human systems, which will lead to informed decisions regarding sexual and reproductive health. Lecture three hours per week. Special course fees may apply. Prerequisite, None. It is recommended this course be taken concurrently with BIOL 1001. Spring.

BIOL 1063. People and the Environment Major environmental issues facing our society will be covered to equip students to become part of the solution to many environmental challenges confronting us this century. Lecture three hours per week. It is recommended this course be taken concurrently with BIOL 1001. Special course fees may apply. Fall, Spring.

