

Center for Ecology, Evolution, and Behavior

Submitters

Gil Rosenthal (BIOL)	Charles Lafon (GEOG)
Michael Alvard (ANTH)	Thomas Olszewski (GEOL)
Darryl de Ruiter (ANTH)	Anne Raymond (GEOL)
Sharon Gursky-Doyen (ANTH)	Michael Tice (GEOL)
Jeff Winking (ANTH)	Anja Schulze (MARB)
Charles Criscione (BIOL)	Jay Walton (MATH)
Ira Greenbaum (BIOL)	Lisa Campbell (OCNG)
Adam Jones (BIOL)	Heath Mills (OCNG)
Hugh Wilson (BIOL)	Antionietta Quigg (OCNG, TAMUG)
Tiffani Williams (CPSC)	Daniel Thornton (OCNG)
Spencer Behmer (ENTO)	Roger Sansom (PHIL)
Micky Eubanks (ENTO)	Heather Wilkinson (PLPA)
Raul Medina (ENTO)	William Murphy (VIBS)
John Oswald (ENTO)	Paul Samollow (VIBS)
Michel Slotman (ENTO)	Michael Criscitiello (VTPB)
Robert Wharton (ENTO)	Stephen Davis (WFSC)
Jim Woolley (ENTO)	Thomas DeWitt (WFSC)
Anna Armitage (ESSM, TAMUG)	Lee Fitzgerald (WFSC)
Tom Boutton (ESSM)	Frances Gelwick (WFSC)
Kostya Krutovsky (ESSM)	Luis Hurtado (WFSC)
Georgianne Moore (ESSM)	Mariana Mateos (WFSC)
William Rogers (ESSM)	Jane Packard (WFSC)
Jason West (TALR, ESSM)	Markus Peterson (WFSC)
Brad Wilcox (ESSM)	Daniel Roelke (WFSC)
David Cairns (GEOG)	Gary Voelker (WFSC)
William Heyman (GEOG)	Kirk Winemiller (WFSC)

Invited Colleges/Schools

College of Agriculture and Life Sciences
College of Science
College of Geosciences
College of Engineering
College of Veterinary Medicine & Biomedical Sciences
College of Liberal Arts
Texas AgriLife Research
Texas A&M University at Galveston

Summary

Understanding why living things do what they do touches every field of scholarly inquiry. Ecology, Evolution, and Behavior (EEB) can inform policy decisions on concerns ranging from population growth outpacing resource availability, to coping with drug-resistant disease agents, managing extinction risk due to global climate change, and mitigating social conditions that foster terrorism. Texas A&M University currently has 66 tenure- and tenure-track faculty working in the field of EEB, but unlike any other peer university, we lack a formal degree-granting program in the area. We propose a novel scheme for a world-class PhD-granting program that capitalizes on the existing departmental structure to encourage integration and collaboration across disciplines.

1. MERIT AND IMPACT

1.1. Global Merit and Impact

The most important questions in the life sciences today scramble conventional disciplinary boundaries and dispense with the traditional distinction between applied and basic research. How does the rapid evolution of harmful bacteria and viruses inform drug design and agricultural policy? How are endangered birds, tropical diseases, and crop pests responding to global climate change? How does evolutionary history influence human economic decisions, political behavior, and psychopathology? How do we deal with population growth that far exceeds resource availability? At every top-20 university in the U.S. (but not at TAMU), these kinds of questions fall under the purview of a degree-granting program in Ecology, Evolution, and Behavior (EEB, also known as Integrative Biology or Organismal Biology). The fundamental questions of EEB are central to our understanding of how living systems work, how human minds and bodies work, and how the Earth works.

Addressing these kinds of questions requires an increasingly interconnected perspective, and TAMU is uniquely poised to become a leader in the field. Our Interdisciplinary Research Group (IRG) in EEB includes 66 faculty spread across 13 departments in six college-level units. A major strength of the group at TAMU, given the intrinsically integrative nature of the field, is that we (can and do build) collaborations not only within our IRG, but also with other researchers with complementary interests.

Accordingly, faculty members collaborate within and across their departments on cutting-edge research. We conduct theoretical and laboratory research here at TAMU, and field research across Texas, the U.S., and in dozens of countries around the world. The multimillion NSF-IGERT in Applied Biodiversity Science, one of only two IGERT grants in the history of this campus, is comprised largely of EEB members. Collectively, the EEB group brought in over \$30 million in new extramural funding and published over 300 peer-reviewed papers in FY 2007, which should make TAMU extremely competitive with EEB programs at other leading universities.

However, because we have no identity as a degree-granting program, TAMU is ranked poorly, or not at all, in this major area of the life sciences. The National Research Council's 2007 rankings for the EEB category have TAMU at #76; UT Austin is #10 and Texas Tech is #69. US News and World Report 2008 does not have TAMU ranked, whereas UT Austin is ranked #9. US News and World Report ranks TAMU at #68 in the Biological Sciences, and ranks UT Austin #23. While several of our faculty are acknowledged as some of the most important scholars in their fields, and most of our new faculty hires compare favorably with their peers at top-20 universities, we have no institutional reputation in EEB. This is a serious limitation in terms of competing for the best graduate students and postdocs, and many TAMU life science faculty members recently have received reviews of proposals seeking support for postdoctoral training that rated the biological research environment at TAMU as merely "adequate".

This White Paper is submitted by fifty-two members of the Interdisciplinary Faculty of Ecology and Evolutionary Biology at TAMU, with the unanimous approval of the Faculty's Executive Committee. The goal of the proposed Center for Ecology, Evolution, and Behavior (CEEB) is to address the need for a coherent degree-granting program, while enhancing the vital interdisciplinary approach that emerges from our positioning in a broad array of departments. As mentioned previously, every top-20 university has a degree-granting program in EEB. Some of these (e.g. Yale, Chicago, Cornell, UT Austin) are stand-alone academic departments. While these are advantageous in terms of programmatic coherence and hiring decisions, they tend to discourage the broadly integrative approach that is so essential to contemporary science. Conversely, interdisciplinary degree programs (IDPs, e.g. UC Davis, Duke, Michigan) are good at connecting departments, but tend to be more tenuous in terms of funding and administrative commitments, and offer no opportunity to grow programmatically by hiring faculty in targeted areas. Here at TAMU, IDPs are poorly funded, offer little in the way of student support, and are administered by faculty members with no relief from other responsibilities.

The proposed Center is a hybrid model that would create an interdisciplinary degree program backed by graduate teaching assistantships, merit fellowships, and influence over new faculty hires, while enabling current and future EEB faculty to continue working within the existing departmental structure. The Center would be headed by a senior-level scholar in EEB with an administrative rank equivalent to Department Head. In addition to graduate stipends, the budget would include funds for student travel and seminars (as the Interdisciplinary Research Program EEB budget currently does in a modest way) and for recruiting of new faculty in concert with participating departments.

As amply argued in E.O. Wilson's "Consilience" (1998), EEB is in a very real sense the intellectual "glue" that holds the life sciences together and connects them with the social sciences. EEB lies at the heart of conservation, wildlife management, and agricultural policy; of parasitology, epidemiology, and evolutionary medicine; and of the biological foundations of how people and societies behave. From a purely pragmatic perspective, EEB is the most straightforward and cost-effective point of entry for TAMU into the elite ranks of the life-sciences. We already have 66 faculty in this area, many more than most universities with established programs, and we have achieved a nationally- and internationally-recognized track record of excellence, whether as individuals or as collaborative groups. We do not need massive investments in infrastructure or capital equipment; what we need, at modest cost, is the ability to function as a viable degree-granting program. This will allow our excellence at the individual level to be reflected at a programmatic level, and will put us in a position to attract the very best graduate students and maximize our competitiveness for funding.

We have chosen to submit the proposed Center under the Research initiative, rather than under the subsequent Teaching initiative, because the primary role of PhD students is to develop and carry out cutting-edge research. The quality of the faculty we can attract, our publication output, and our ability to secure research funds depend critically on our ability to compete for the top PhD students.

1.2. Building Intellectual Capacity at Texas A&M

The current lack of a degree-granting program in EEB is a recurring problem when it comes to recruiting outstanding graduate students. TAMU is unusual in not having such a program, and students with an interest in ecology, evolution, and behavior are unlikely to even apply here unless they have been in contact with specific faculty. Those of us who serve on graduate admissions committees frequently see some of the best students opt for another university because they are concerned that a departmental program doesn't fit their career-development needs. The lack of an EEB program is also a concern for new faculty recruits, who are also choosing between TAMU and institutions with degree-granting programs in their area of research. A degree program in EEB would instantly put our faculty on the international radar and make us seriously competitive with top-20 institutions.

It takes several years for new faculty to appreciate the amazing array of research being done across campus; the challenge is much greater for undergraduates. Outstanding students with an interest in EEB are likely to be drawn to our rival to the west, with its renowned program in Integrative Biology. The CEEB would, at no marginal cost, serve as a clearinghouse of information regarding classes, seminars, jobs, and opportunities for field or laboratory research. Students will be drawn here if they know they can exploit summer learning opportunities on topics ranging from community-based natural resource management in Namibia, to monitoring otter behavior in Alaska, to entomological or agricultural research at TAMU's new Casa Verde Center in Costa Rica.

2. MULTIDISCIPLINARY ASPECTS AND ORGANIZATION

2.1. Multidisciplinary Aspects

The Center is explicitly designed to facilitate the multidisciplinary nature of EEB. There is often more similarity among EEB-IRG members across colleges than within departments; for example, Biology and Wildlife and Fisheries each have two faculty members working on the evolutionary ecology of livebearing fish. One of the themes that emerged from discussion among EEB faculty, however, was that

many members were engaged in productive collaborations with departmental colleagues with divergent expertise: insect behaviorists with nutritional physiologists in ENTO; paleontologists with geomorphologists in GEOL; evolutionary biologists with molecular geneticists in BIOL; theoretical ecologists with agricultural economists in ESSM. This integrative collaboration is part of the great strength of the current EEB faculty, and is the main impetus behind preserving the current departmental structure. At the same time, through a common graduate program and regular seminar series, the CEEB will greatly facilitate interactions among faculty in different colleges working in conceptually integrated areas.

2.2. Suggested Organization

The proposed Center is campus-wide and does not require any additional space except laboratory and office space for the Center's Director and his or her administrative support. A formal proposal for a Ph.D. program in Ecology, Evolution, and Behavior will be routed through appropriate channels. Criteria for faculty membership in the CEEB will be modeled after those of existing IDPs. The Director will be tasked with forming committees among CEEB faculty for graduate recruiting, graduate admissions, graduate curriculum development, graduate fellowships, seminars, faculty membership, and faculty recruitment. Students will be guaranteed five years of support upon admission. Five graduate fellowships, paying tuition, fees, and a nationally competitive stipend, will be made available each year, two to recruit exceptional new students and three as an incentive for meritorious current students. 25 nine-month teaching assistantships will be available to the remaining students. Factoring in University fellowships, external fellowships (e.g. NSF predoctoral awards, EPA STAR grants) and grant-funded research assistantships, this will allow us to sustain a graduate student population of about 40 students, with eight new recruits a year. A program of this size will allow for enriching interactions among students, and mentoring of new students by more senior ones. Team-taught core classes and weekly EEB seminars will also forge interactions among students and faculty across campus. Postdoctoral fellows, funded through individual traineeships or faculty grants, will have the option of affiliating directly with the EEB program.

The Director will also have access to \$100,000 annually for recruitment of new faculty. These funds will be used to conduct joint faculty searches in consultation with participating departments, as priority areas for growth within EEB are identified. The funds will be obligated towards new faculty offers extended by the Heads of the relevant departments, at the discretion of the Director per consultation with CEEB faculty.

3. SYNERGIES AND COMPETITIVE ADVANTAGE

3.1. Synergies with University and College Plans

The goal of Vision 2020 is for TAMU to become one of the country's top 20 public universities within the next twelve years. Our EEB group is already in this league, but we need a nationally-recognized, formal identity in order to be perceived as such. The integrative nature of EEB means that increased prestige and increased quality of students is likely to have a ripple effect, and increase the overall quality of the life sciences at TAMU.

A precept of Vision 2020 is to "encourage an institutional global network". EEB members do field work all over the world and engage in intellectual collaborations with colleagues worldwide; further, they interact with governments and NGO to implement policies relevant to conservation, agriculture, and natural research management. EEB faculty are often TAMU's face to the world, and offer graduate and undergraduate students a full spectrum of cultural experiences in places where tourists seldom tread. TAMU's position a short drive away from the Latin American tropics has made us an international center of research in tropical biology. Twenty of us base a substantial portion of our research there, and we have recruited numerous graduate students and postdocs from Latin America.

EEB is integral to the Strategic Research Plans of the participating Colleges. The **College of Veterinary Medicine & Biomedical Sciences'** landmark area in Biomedical Genomics includes several EEB participating faculty; integration across broad areas of evolutionary biology will be essential for any program in comparative genomics. "Increased participation in interdisciplinary graduate programs" is also a priority of the CVMBBS Research Plan. The EEB umbrella will complement the **College of Liberal Arts'** Landmark Area in Diversity and Society, which studies "diversity brought about by large population changes", traditionally a major research focus of the field of behavioral ecology. "Culture and Change"; "Governance, Social Institutions, and Behavior"; and "Health, Human Wellness, and Health Care" interface naturally with EEB research strengths in evolutionary anthropology, the evolution of cooperation, and evolutionary medicine. One of the **College of Engineering's** Landmark Areas is "Sustainable Advanced Energy Systems (Energy, Water, Environment)". Sustainability, the key benchmark for this enterprise, is often a focus of controversy for novel "green" technologies, which often incur environmental costs in one area even as they offer solutions in another. Ecological sustainability is a concept developed within EEB and is a key research focus for many members of our program. Partnership with a world-class EEB program would benefit the Landmark Area's stated goal of a "system-informed approach" for engineers trying to develop genuinely sustainable technologies. Within the **College of Science**, the Biology Department focuses on the mechanistic underpinnings of EEB – specifically neurobiology, "from genetics to behavior", and, in Statistics, biostatistics as applied to population genetics. One of the most tangible benefits of the EEB-IRG has been the collaborations that have arisen between Biology faculty and EEB faculty in other Colleges.

The **College of Geosciences'** Strategic Research Plan is intertwined with EEB. "Climate Research from Deep to Future Time" connects with EEB topics ranging from glacial cycles that have shaped macroevolution, through rapid climate change that changes the composition of ecological communities and threatens mass extinction. "Sedimentary Geology and Geobiology", of course, depends critically on paleontology and evolutionary biology; "Coastal Processes" involve the origin and maintenance of communities of marine organisms; and "Coupled Natural-Human Systems" focuses on studying "the impacts on ecosystem services in what are becoming some of the most threatened biomes in the world". All of these research areas depend on EEB faculty within the College, and will be greatly enhanced by formally strengthening interactions with faculty with complementary interests in other Colleges, particularly CoS and COALS.

A plurality of EEB-IRG members are affiliated with the **College of Agriculture & Life Sciences** and **Texas AgriLife Research**. Again, EEB is intimately linked to COALS' Landmark Area in "Healthy Ecosystems"; as mentioned above, integrated approaches to ecosystem assessment and conservation will require broadly interdisciplinary perspectives in order to succeed. The focus on "fundamental biology" also relies on a foundation of ecology, evolution, and behavior.

This proposal is complementary to several other research white papers currently being considered, and many of us are submitters on related proposals. One of the two central research themes of the **Applied Biodiversity Science** (ABS) white paper is "Ecological Functions and Biodiversity", which is a central research focus of EEB. The currently funded NSF Integrated Graduate Research, Education, and Teaching in ABS Applied Biodiversity Science is unique in connecting ecology with issues in the social sciences (sustainable development and governance). EEB is unique in connecting ecology with evolutionary history and with the mechanisms underlying biological function. The white paper in **Collections-Based Research** reinforces one of the mainstays in studying ecology, evolution, and behavior; namely, the rich quantity of data that can be mined from well-managed collections of biological materials and information. These three proposals center around the same theme of bringing greater centralization and coherence to our broadly-based strength in ecology, evolution, and behavior.

3.2. Potential Texas A&M Competitive Advantage

TAMU is unique in having an unusually large number of faculty members in the field of Ecology, Evolution, and Behavior, spread out across disciplines ranging from Philosophy to Entomology. Much more than colleagues at peer institutions who are clustered in EEB departments, we build our research programs on integrative collaborations cutting across broad swaths of academic inquiry. We need an EEB degree program simply to catch up to our peer institutions, all of which have well-developed programs in this field. The proposed Center, however, provides an opportunity for us to surge ahead, by combining the best features of integrative collaboration across disparate departments with a conceptually unified program in a fundamental area of the life sciences.

4. CRITICAL MASS AND GROWTH NEEDS AND POTENTIAL

4.1. Existing Critical Mass

Because we have no programmatic identity, we are not nationally recognized as being strong in EEB. Collectively, however, the 66 members of the EEB-IRG are already one of the largest, best-funded, and most academically productive EEB groups in the country (Appendices A-B).

4.2. Needs for and Availability of Candidates for Building Excellence

One additional faculty position is requested, at the Full Professor level, to serve as Director of the CEEB. The Director should be an internationally recognized scientist with a broadly integrative perspective on ecology, evolution, and behavior, a history of securing public and private funding, and administrative experience. The opportunity to put one's unique stamp on a new graduate program and to play an influential role in new faculty hires should be attractive to a broad range of candidates. One full-time support person is requested to assist the Director in administrative duties.

5. SPACE AND INFRASTRUCTURE

No additional space required beyond space for Director's office and lab, and administrative office.

6. JUSTIFICATION FOR INVESTMENT OF RESOURCES

Better graduate students and more recognition will translate into more extramural funding. The most immediate impact, via the increase in the quality of the students and postdocs we can recruit, will be more individual-based awards, e.g. Ford Foundation fellowships, NSF pre- and postdoctoral fellowships, EPA STAR fellowships, NSF Doctoral Dissertation Improvement Grants, and NIH National Research Service Awards. TAMU's enhanced institutional stature in EEB will also make our research groups more competitive for NSF-IGERT, FIBR, and major instrumentation grants, as well as partnerships with private foundations and NGOs.

7. COST EFFECTIVENESS

EEB presents an opportunity for TAMU to dramatically raise its profile in the life sciences, at minimal cost. With 66 faculty members in place, the only step remaining is to build an administrative structure that creates a viable program. The only major expenditures are (1) a leading senior faculty member to serve as Director; (2) an administrative coordinator for the Center; and (3) fellowships and teaching assistantships for graduate students. Funds for new faculty recruiting could be proportionately reallocated from participating departments. These expenditures would allow us to not only catch up to peer universities with programs in EEB, but to take an innovative lead in combining the integrative nature of an interdisciplinary graduate program while simultaneously taking advantage of the traditional strengths of academic departments.

APPENDICES

APPENDIX A. RESEARCH PARTICIPANTS

Name	Position	Department	Special Qualifications
Alvard, Michael S.	Associate Professor	ANTH	Evolution of human behavior
Armitage, Anna	Assistant Professor	MARB	Trophic organization in benthic coastal habitats
Behmer, Spencer T.	Assistant Professor	ENTO	Physiological and behavioral ecology
Boutton, Thomas	Regents Professor	ESSM	Ecology of grassland and savanna ecosystems
Briske, David D.	Professor	ESSM	Grassland ecology and global change
Cairns, David	Associate Professor	GEOG	Landscape ecology and ecosystem modeling
Campbell, Lisa	Professor	OCNG	Ecology of marine phytoplankton
Coulson, Robert	Professor	ENTO	Insect-landscape interactions
Criscione, Charles	Assistant Professor	BIOL	Population genetics and ecological genomics of parasites
Criscitiello, Michael	Assistant Professor	VTPB	Evolutionary genetics of immune function
Davis III, Stephen E.	Assistant Professor	WFSC	Structure-function relationships in aquatic ecosystems
de Ruiter, Darryl	Assistant Professor	ANTH	Ecosystem change and primate evolution
DeWitt, Thomas J.	Associate Professor	WFSC	Ecological mechanisms of evolutionary diversification
Eubanks, Micky	Associate Professor	ENTO	Ecological consequences of insect-plant interactions
Fitzgerald, Lee	Associate Professor	WFSC	Evolutionary ecology of amphibians and reptiles
Gelwick, Frances P.	Associate Professor	WFSC	Community ecology and aquatic bioassessment
Gold, John R.	Professor	WFSC	Molecular ecology and quantitative genetics of fishes
Greenbaum, Ira F.	Professor	BIOL	Chromosomal rearrangements and vertebrate evolution
Gursky, Sharon	Assistant Professor	ANTH	Behavioral ecology of nonhuman primates
Heinz, Kevin M.	Professor	ENTO	Behavioral ecology of host-parasitoid interactions
Heyman, William	Associate Professor	GEOG	Reproductive ecology and fisheries management
Hurtado, Luis	Assistant Professor	WFSC	Molecular systematics and marine biogeography
Jackson, George A.	Professor	OCNG	Biological-chemical-physical modeling
Jones, Adam G.	Assistant Professor	BIOL	Molecular genetics of sexual selection

APPENDIX C. RESOURCE REQUIREMENTS

Please supply quality information based on benchmarks and data from peer institutions.

Faculty Hire Needed					
Area of Expertise	Position/Rank	Start-up Costs	Annual Costs (including salary) for all associated personnel and activities	Annual Costs not covered externally	Space Needed (including graduate and research personnel). Provide total footage and description of space.
Ecology, evolution, and behavior	Full Professor	\$1,000,000	\$250,000 (\$200,000 salary plus \$50,000 endowed chair)	\$250,000	3000 sq. ft. laboratory and office space
	Administrative assistant		\$80,000	\$80,000	200 sq. ft. office space
	Graduate merit fellowships (including tuition)		\$34,000 X 5 = \$170,000	\$170,000	

Extra Space Needs for Existing Personnel	
Person or Group	Space Needed (Provide total square footage and description of space)
NONE	

Equipment & Facilities (not available on campus)		
Identify Users (if new personnel, specify)	Cost	Funds Available or Projected
NONE		