

ANNUAL REPORT: June 1, 2011 – May 31, 2012
(i.e., Summer 2011, AY 2011-2012)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

NAME: J Scott Turner

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

	<i>Course number</i>	<i>Title</i>	<i>Credhrs</i>	<i>No of students</i>	<i>No of lab sect</i>
SUMMER:					
FALL:	EFB 200	<i>Physics of Life</i>	3	134	
	EFB 462	<i>Animal Physiology: Environmental & Ecological</i>	3	89	-
	EFB 662	<i>Animal Physiology: Environmental & Ecological</i>	3	4	-
SPRING:					

NOTE: PLEASE INDICATE WHICH COURSE(S) HAD A SERVICE-LEARNING COMPONENT AND BRIEFLY EXPLAIN THE NATURE OF THIS COMPONENT. For examples of service-learning in courses, see: <http://www.esf.edu/students/service/courses.htm>. Service-learning is a form of structured experiential education in which students engage with the community to be active learners, to enrich their sense of civic responsibility, and to explore practical application for course content. Faculty oversight, reflective thinking, and reciprocity are key components of service-learning. EFB courses currently listed with service-learning components include: 416/6/1, 486, 518, 521, 532, 446/646.

None

2. Non-Scheduled Course Offerings (e.g., 496, 899, 999)

	<i>Course number</i>	<i>Title</i>	<i>Credhrs</i>	<i>No of students</i>	<i>No of lab sect</i>
SUMMER					
SPRING:	EFB 420	<i>Internship</i>	3	1	
	EFB 420	<i>Internship</i>	6	1	

3. Continuing Education and Extension (short courses, workshops, etc.)

None

4. Guest Lecture Activities

Two lectures in Diversity of Life
One lecture in Principles of Evolution
Served on evaluation panel for EFB 202 at Cranberry Lake

II. STUDENT ADVISING

A. Number of undergraduates for whom you are the student’s official advisor 22 and unofficial advisor I have no idea what this means.

B. Graduate Students: (Name, degree sought, starting date, month & year; if a degree was completed, please give date and full citation for the thesis or dissertation).

MAJOR PROFESSOR

CO-MAJOR PROFESSOR

MEMBER, STEERING COMMITTEE (other than those listed above)

Name	<i>Degree sought</i>	<i>Starting date (Mo & Yr)</i>	<i>Degree completed?</i>	<i>Thesis or dissertation citation</i>
Lauren Goldmann	PhD	Aug 2010	No	N/A
Ian Gerig	PhD	Aug 2009	No	N/A

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

=

III. RESEARCH COMPLETED OR UNDERWAY

A. Departmental Research (unsupported, boot-logged; title - % time spent)

None

B. 1. Grant-supported Research (source, subject, amount - total award and current year, award period starting and ending dates; list graduate research assistants supported by each grant)

Source	<i>Title</i>	<i>Amount</i>	<i>Current year</i>	<i>Award period</i>	<i>Graduate Assistants supported</i>
US Army Research Office	<i>Collective structural defense of the mound-building termites of the genus Macrotermes</i>	<i>\$300,000</i>	4	June 2008 to June 2012	0
Human Frontiers Science Program	<i>From swarm intelligence to living buildings. Novel concepts of managing internal climates</i>	<i>\$1,350,000</i>	0	August 2012 to July 2015	1
Jacob Blaustein Center for Scientific Cooperation (Ben Gurion University of the Negev)	<i>Visiting Foreign Scientist</i>	<i>\$5,000</i>	1	1 December 2012 to 31 December 2012	0

2. Research Proposals pending (include information as in B.1., above).

3. Research Proposals submitted, but rejected (include information as in B.1., above)

Source	<i>Title</i>	<i>Amount</i>	<i>Award period</i>	<i>Graduate Assistants supported</i>
National Science Foundation	<i>Evolutionary roots of swarm construction</i>	<i>\$438,346</i>	June 2012 to May 2015	2
National Science Foundation	<i>New concepts of mass exchange in animal burrow systems</i>	<i>\$2</i>	January 2013 to December 2015	2

IV. PUBLICATIONS (Full bibliographic citation, i.e., do not use "with Jones," or "Jones, et al."; please list only publications published, in press, or actually submitted during this reporting period --- **do not list manuscripts in preparation**).



A. Refereed Publications

- Turner, J S** (2012). Evolutionary architecture? Some perspectives from biological design. *Architectural Design* **82**(2): 28-33.
- Turner, J S.** In press. Superorganisms and superindividuality. The emergence of individuality in a social insect assemblage. In: Frédéric Bouchard and Philippe Huneman (eds). *From Groups to Individuals. Perspectives on Biological Associations and Emerging Individuality*. The Vienna Series in Theoretical Biology. MIT Press.
- Turner, J S.** In press. Biology's second law. Homeostasis, purpose and desire. In: B. G. Henning and A. Scarfe. (eds). *Beyond Mechanism. Putting Life Back into Biology*. Lexington Books/Rowman & Littlefield.
- Turner, J S.** In press. The semiotics of a superorganism. In: K. Kull and J. Hoffmeyer (eds) *Approaches to Semiosis of Evolution*. Heidelberg, Springer.
- Turner, J S.** In press. Homeostasis and the forgotten vitalist roots of adaptation. In: C. T. Wolfe and S. Normandin (eds) *Vitalism and the Scientific Image*. C. Heidelberg, Springer.
- Odling-Smee, J and J S Turner.** In press. Niche construction theory and human architecture. *Biological Theory*.
- Turner, J S.** submitted. The insect mound as superorganism. *Insectes Sociaux*.

B. Non-refereed Publications

- J S Turner.** 2012. The thermodynamics of life. Book review. *Work Meets Life . The Integrative Study of Work in Living Systems*. Robert Levin, Simon Laughlin, Christina de la Rocha and Alan Blackwell (eds). 2011. *Metascience* 21 (2): 371-373.

Media

	Title/Description	 
J S Turner. 2012	Visualization of flow using laser sheets <i>Scott Turner and Berry Pinshow outline the basic method for using laser sheets to illuminate the structure of complex flows.</i>	http://www.youtube.com/watch?v=3slw-KFxJ8
J S Turner. 2012	Using lasers to visualize boundary layer flows <i>Berry Pinshow, Nils Napp, Kirstin Petersen and I use laser sheets to visualize boundary layer flows near the entrances of the ant Pheidole. Filmed on location in Namibia</i>	http://www.youtube.com/watch?v=xjLuwD_Cisabm7vck
J S Turner. 2012 C Baycura	Biology's Second Law. Introduction. <i>The problem with biology today is we think we have a coherent theory of biology, but we don't. Homeostasis--biology's second law--can be the bridge to get us there.</i>	http://www.youtube.com/watch?v=xjLuwD_Cisabm7vck

- J S Turner. 2012**
C Baycura
- Biology's Second Law: Homeostasis
If homeostasis is Biology's Second Law, what's homeostasis? Our current conception of homeostasis is a pale imitation of Claude Bernard's original conception of it. To appreciate how profound an idea it is, we must define it properly, and clear away some of the misconceptions that have built up around it.
- http://www.youtube.com/watch?v=4acJ5zUSifs&feature=player_embedded
- J S Turner. 2012**
C Baycura
- Biology's Second Law: Lamarck
Lamarck, widely regarded as a misguided predecessor of Darwin, is one of the most misunderstood figures in biology. Here I try to set the record straight, for it is in the true understanding of Lamarck that the need for Biology's Second Law is justified.
- http://www.youtube.com/watch?feature=player_embedded&v=f-qNfhoil7U
- J S Turner. 2012**
C Baycura
- Biology's Second Law: The Weismann Barrier. The barrier that wasn't
The Weismann barrier-the doctrine of germline segregation developed by the German biologist August Weismann in the late 19th century-has long been regarded as the decisive disproof of the Lamarckian idea. New discoveries in molecular genetics are showing the Weismann barrier to be just the opposite of what it has long been thought to be. Rather than isolating the germline cells, the Weismann barrier is the active manager of epigenetic inheritance between soma and germline.
- http://www.youtube.com/watch?feature=player_embedded&v=dicq8QuKSDk
- C Baycura. 2012.**
- Conversations with Scott Turner**
Eugene Tssui.
Eugene Tssui is an internationally renowned architect, planner and designer, interested in applying lessons from nature to his designs.
- http://www.youtube.com/watch?v=eSYWlIx8K4U&feature=player_embedded
- C Baycura. 2012.**
- Conversations with Scott Turner**
Nora Bateson.
Nora Bateson, daughter of the famous anthropologist, psychologist and evolutionist, visited ESF to screen her film about her father, An Ecology of Mind. We talk about her father, her film, and what she learned from her father about life.
- http://www.youtube.com/watch?v=x8VFETiwQq4&feature=player_embedded
- C Baycura. 2011**
- Conversations with Scott Turner**
Rainer Brocke.
Eugene Tssui is an internationally renowned architect, planner and designer, interested in applying lessons from nature to his designs.
- http://www.youtube.com/watch?v=9Z7954fPM7Y&feature=player_embedded

- C Baycura.** 2012. ***Conversations with Scott Turner***
 Lisa Margonelli.
Lisa Margonelli is a freelance journalist. Until recently, she was an energy policy analyst for the New America Foundation in Washington DC. She is also the author of the acclaimed book Oil on the Brain. Here, we discuss energy, oil and its future. http://www.youtube.com/watch?feature=player_embedded&v=H4gWIM74PMA
- C Baycura.** 2012. ***Conversations with Scott Turner***
 Paul Ottesen.
Paul Ottesen, webmaster of SUNY-ESF, discusses the big changes coming in the relationship between higher education and educational content delivery on the web. http://www.youtube.com/watch?v=5tvq9V4GfhU&feature=player_embedded
- C Baycura.** 2009 ***Conversations with Scott Turner***
 Robert Sternberg.
Robert Sternberg, a biologist and filmmaker from Imperial College of London, visited ESF to discuss his film about the controversial biologist Donald Williamson, who claimed to have shown a new process of evolution in his work on starfish larvae. http://www.youtube.com/watch?feature=player_embedded&v=JdlaVAskIEY
- J S Turner.** 2012 Unrestrained stigmergic building
This is a 22 hour time lapse sequence of Macrotermes workers building in an observation pipe. This demonstrates a kind of cognitive trap, where building continues for much longer than it does in the mound. This is due to a distortion of the feedback signals that control repair building, caused by confining building within the impermeable walls of the pipe. http://www.youtube.com/watch?feature=player_embedded&v=ODG9Pu7SxLQ
- J S Turner.** 2011 Repair building by a *Macrotermes* swarm
When a hole is drilled in a Macrotermes mound, a crew of workers is mobilized to plug the breach. Here is a time lapse video (spanning 8 hours) of that process in action http://www.youtube.com/watch?feature=player_embedded&v=cXC0DiF7gAQ
- J S Turner.**2011. An Introduction to Namibia
A brief introduction to the country of Namibia, prepared in support of SUNYESF's mission for advancing international environmental science. http://www.youtube.com/watch?feature=player_embedded&v=wFYIj7uGIs
- J S Turner.** 2011
C Baycura Transient state gas exchange
How termite mounds capture transient state turbulent winds to power the colony's respiratory gas exchange. This video summarizes the two principal mechanisms that are believed to promote mixing of stratified nest air and mound air: pendelluft mixing and resonant mixing. This video is an excerpt from a longer video presented to an international conference on new concepts in mine ventilation, in Johannesburg, South Africa http://www.youtube.com/watch?feature=player_embedded&v=Yqk8dqwOMZw

<p>J S Turner. 2011 C Baycura</p>	<p>The paradoxical locomotion of the water strider <i>Water striders inhabit the interface between air and water. When they move about, are they swimming or walking? The answer will surprise you.</i></p>	<p>http://www.youtube.com/watch?feature=player_embedded&v=owbGh089kU</p>
<p>J S Turner. 2011</p>	<p>Grooming behavior of <i>Macrotermes michaelseni</i> <i>The rich social interactions of swarms of Macrotermes workers..</i></p>	<p>http://www.youtube.com/watch?v=uMr7BQBW52U&feature=player_embedded</p>
<p>J S Turner. 2011 C Baycura</p>	<p>Angie and the vortex <i>Swimming, flying and paddling all rely on a common mechanism for generating thrust - imparting momentum to a relatively stationary fluid vortex.</i></p>	<p>http://www.youtube.com/watch?feature=player_embedded&v=ziVizcRupLs</p>
<p>J S Turner. 2011 C Baycura</p>	<p>Life at low Reynolds number <i>The strange viscous world of little things that live in ponds.</i></p>	<p>http://www.youtube.com/watch?feature=player_embedded&v=qZk2bMaqs1E</p>
<p>J S Turner. 2011 C Baycura</p>	<p>Learning from Nature Termite Mound Lungs and the Implications for Breathing Mines <i>The mound building termites of southern Africa are natural miners that have developed some novel methods for ventilating their subterranean habitats. Prof Scott Turner describes new findings that clarify these mechanisms, and outlines some of their implications for novel strategies for ventilating mines. Presented to the Mine Ventilation Africa 2011 conference at the Sandton Sun Hotel, Johannesburg, 16 November 2011.</i></p>	<p>http://youtu.be/k64yPOMNyc</p>

B. Papers Presented at Science Meetings (give title, date, occasion, and location)

New concepts in termite-inspired design. 14 November 2011. Annual meeting of the American Society of Mechanical Engineers. Denver, Colorado.

New concepts in ventilation of animal-built structures. 5 January 2012. 12th Pan-American Congress of Applied Mechanics, Port of Spain, Trinidad and Tobago.

There's lots of room in the transients. 8 June 2012. Noise and Rhythm. 3rd International Wyss Institute Symposium. Harvard University, Cambridge, Massachusetts.

D. Public Service Presentations (lectures, seminars, etc. to and for the public; give group or occasion, date(s), and attendance)

Learning from nature. Termite mound lungs and the implications for breathing mines. Invited virtual presentation and panel discussion. Mine Ventilation Africa 2011 conference at the Sandton Sun Hotel, Johannesburg, 16 November 2011. About 500 people in attendance.

The air-conditioned termite nest revisited. Seminar program, Jacob Blaustein Institute for Desert Research, Sede Boqer, Ben Gurion University of the Negev. 20 December 2011. About 20 people in attendance.

The water potential and monitoring of soil water. A primer. 15 March 2012. Climate Change Adaptation Planning Workshop, Akwesasne Nation. About 20 people in attendance.

An Ecology of Mind panel. 31 March 2012. Panel discussion for screening of Nora Bateson's documentary about Gregory Bateson, *An Ecology of Mind*. Cazenovia College. About 180 people in attendance.

V. PUBLIC SERVICE

A. Funded Service (include consulting activities)

1. Government Agencies (Federal, State, Local):

Ran a workshop on water potential and soil water measurement for the Akwesasne Nation.

2. Industrial and Commercial Groups, etc.

b. Unfunded Service to Governmental Agencies, Public Interest Groups, etc.

VI. PROFESSIONAL DEVELOPMENT

b. Professional Honors and Awards (for teaching, research, outreach, etc.)

b. 1. Activities in Professional Organizations (offices held, service as chairman, member, participant or consultant)

2. Professional Society Membership

b. Other Professional Activities

b. Editorial activity

Journal(s)

Bio-Complexity

Intelligent Buildings International

Responsibility

Editorial board

Guest editor to special issue on biomimetic architecture

Other (books, symposia, etc.)

b. Reviewer

<i>Journal(s)</i>	<i>No of manuscripts</i>
<i>Journal of Zoology</i>	2
<i>Science</i>	1
<i>Journal of the Royal Society Interface</i>	1
<i>Journal of Avian Biology</i>	1
<i>Public Library of Science (PLoS)</i>	1
<i>Communicative and Integrative Biology</i>	1
<i>Origins of Design in Nature</i>	1
<i>Bio-Complexity</i>	1
<i>Agency</i>	<i>No of proposals</i>
<i>John Templeton Foundation</i>	1

Other

c. Participation (workshops, symposia, etc.)

Name of workshop, etc.

Date

Place

C. Further Education/Re-training Undertaken, Leaves, Workshops, etc.

D. Foreign Travel (Where, When, Purpose)

Trinidad and Tobago. December 2011. To present a paper at PACAM XII

Israel. December 2011. Grant development

Namibia. April 2012. Field research

Namibia. June 2012. Field research

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

B. College-level

Ad Hoc Technology Committee.

C. University-wide, including Research Foundation

VIII. SUMMARY OF SIGNIFICANT ACTIVITIES AND ACCOMPLISHMENTS DURING THIS REPORTING PERIOD, ESPECIALLY THOSE MOST NOTEWORTHY AND RELATIVE TO THE COLLEGE'S AND DEPARTMENT'S MISSION. One

paragraph on each of the following would be most helpful: this past year, what have you done for our students, department/college, and self professionally? NOTE: The information in this section (along with the supporting specific information elsewhere in this report) should be your strongest case for being considered for a discretionary raise, which I'll continue to award based on your contributions to the department and college this reporting period.

- 1 EFB 200 Physics of Life was offered for the third time. Its enrollment continues to be strong.
- 2 EFB 462 was offered again, with continued healthy enrollment.
- 3 I was awarded a \$1.35M grant from the Human Frontiers Science Program. I am the Principal Investigator for this grant, and it includes several co-investigators, including L Mahadevan (Harvard), Rupert Soar (Greenwich), Eugene Marais (National Museum of Namibia) and Sanjay Sane (National Centre for Biological Sciences, Bangalore, India). This grant will expand upon my previous work on termite mounds to include work on advanced fluid mechanics, neurobiology of termite swarms, species diversity of termite-built structures, and application to novel methods of wind-driven control of built environments.
- 4 Several invited papers, relevant to my current book project, were completed, and are in process for publication.
- 5 I began production on a new series of video lectures to supplement my current book project. Four videos in this series (entitled *Biology's Second Law*) have been completed. Links to these videos are listed in "Unrefereed publications."
- 6 I hosted two interesting speakers to campus this year: Nora Bateson, who screened her documentary, *An Ecology of Mind*, about her father, Gregory Bateson, and Eugene Tssui, a "biomimetic architect." I was part of a discussion

panel for Nora Bateson's screening at Cazenovia College, and ran a discussion forum for Eugene Tssui. Both were guests on Christopher Baycura's series *Conversations* (links in "Unrefereed publications") where they were interviewed by me.

IX. A. FUTURE PLANS, AMBITIONS, AND POTENTIAL CONTRIBUTIONS FOR YOUR OWN PROFESSIONAL DEVELOPMENT AND THE ENHANCEMENT OF THE PROGRAM IN ENVIRONMENTAL AND FOREST BIOLOGY (brief summary)

- 1 I have cleared my desk of several writing projects that were in the way of completing the manuscript of my third book. I intend to spend the rest of summer 2012 completing this book.
- 2 My HFSP project is projected for a start date of 1 August 2012. I will be doing quite a lot of travel between the USA, England, Namibia and India in support of this project.
- 3 I intend to revamp the online testing protocols for both EFB 200 Physics of Life and EFB 462 Animal Physiology. I also intend to start production of a series of basic power-point based videos, working title "Foundations" to supplement the online content of EFB 200 Physics of Life.
- 4 I am serving on the *Ad Hoc* Technology Committee of Faculty Governance. My hope for this committee is that it will serve as a vehicle for pushing ESF more effectively into the digital future for instruction, which I see as a critical need for the institution's future survival.
- 5 I continue to work to establish an international campus in Namibia. I presented this vision to the ESF Board of Trustees and the Namibia Ministry of Agriculture Research Directorate in Spring 2011. Since that time, Ben Gurion University has entered into this initiative as a partner. A Memorandum of Understanding between SUNY-ESF, Ben Gurion University and the National Museum of Namibia has been signed for developing the programmatic aspects of this project. As of now, we are actively pursuing permission from the Namibia Ministry of Agriculture for the infrastructure aspects of the project.

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2011
 - a. Course(s) to be offered
None
 - b. Proposed research activity
Wrap up work on US Army funded research in termites
Initiate HFSP project
Complete book manuscript
 - c. University, professional society, and public service
Ad Hoc Technology Committee
2. Fall Semester 2011
 - a. Course(s) to be offered
EFB 200 Physics of Life
EFB 462/662 Animal Physiology
 - b. Proposed research activity
Initiate research in India
Continue ongoing research in Namibia

- c. University, Professional society, and public service
Ad Hoc Technology Committee

3. Spring Semester 2012

- a. Course(s) to be offered
none currently planned
- b. Proposed research activity
Research expedition(s?) to Namibia, China, India.
- c. University, professional society, and public service

1. Summer 2012

- a. Course(s) to be offered
- b. Proposed research activity
Research expedition(s?) to Namibia, China, India.
- c. University, professional society, and public service
Ad Hoc Technology Committee