

ANNUAL REPORT: June 1, 2010 – May 31, 2011
(i.e., Summer 2010, AY 2010-2011)
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	118	
	EFB 462	<i>Animal Physiology: Environmental & Ecological</i>	3	90	-
	EFB 662	<i>Animal Physiology: Environmental & Ecological</i>	3	3	-
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			1	1	-
	EFB 999	<i>Doctoral Thesis Research</i>	1	1	
SPRING:	EFB 420	<i>Internship</i>	4	1	
	EFB 496	<i>Overseas Research Experience</i>	12	1	

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

None

4. Guest Lecture Activities

None

II. STUDENT ADVISING

A. Number of undergraduates for whom you are the student's official advisor 26 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

Wendy Park (withdrawn Spring 2011).

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.

Nayoung Jo, October 2010

III. RESEARCH COMPLETED OR UNDERWAY

A. Departmental Research (unsupported, boot-legged; 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	Title	Amount	Current year	Award period	Graduate Assistants supported
US Army Research Office	<i>Collective structural defense of the mound-building termites of the genus Macrotermes</i>	\$300,000	2	June 2008 to June 2012	1
John C Templeton Foundation	<i>Biology's Second Law: Evolution, Purpose and Desire</i>	\$50,000	1	2 years	-

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

Source	Title	Amount	Award period	Graduate Assistants supported
Human Frontiers Science Program	<i>From swarm intelligence to living buildings. Novel concepts of managing internal climates</i>	\$750,000	June 2012 to May 2015	2
National Science Foundation	<i>Swarm robotics and swarm construction</i>	\$500,000	June 2012 to May 2015	2
National Science Foundation	<i>Impedance limited mechanisms for transient-state gas exchange</i>	\$500,000	June 2012 to May 2015	2

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

None

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

J S Turner (2011). Termites as models of swarm cognition. *Swarm Intelligence* **5**(1): 19-43.

J S Turner. 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.

B. Non-refereed Publications

J S Turner. 2010. Dirt lungs. *Natural History*. In press.

			
	Title/Description		
J S Turner. 2011.	Initiation of building by <i>Macrotermes</i> swarms. <i>Building the mound begins with a single step. But how do termites decide how to take that step?</i>	http://www.youtube.com/watch?v=dwC_2fYITg	
J S Turner. 2011.	The click of the click beetle <i>The surprising physics behind the click of the click beetle. Filmed on location in Namibia</i>	http://www.youtube.com/watch?v=-NgGxSQViDk	http://itunes.apple.com/us/podcast/click-beetle/id380141288?i=93889508
J S Turner. 2011.	A brief look at termite repair. <i>The basics of repair of the termite mound.</i>	http://www.youtube.com/watch?v=eZTFPV2DWOo	
J S Turner. 2011 C Baycura	Leaf temperature <i>How plants use leaf shape to control the temperature of their leaves.</i>	http://www.youtube.com/watch?v=mAu2F_oyfs	http://itunes.apple.com/us/podcast/leaf-temperature/id434386126?i=93476800
J S Turner. 2011 R Soar C Baycura	Dynamic architecture. What is it? <i>An interview with Dr Rupert Soar, on new trends in biomimetic architecture. Part 1.</i>	http://www.youtube.com/watch?v=9A88-Be-lRw	
J S Turner. 2011 R Soar C Baycura	Dynamic architecture. Termite mounds-A real example <i>An interview with Dr Rupert Soar, on new trends in biomimetic architecture. Part 2.</i>	http://www.youtube.com/watch?v=0a2GXiS9Cao	
J S Turner. 2011 R Soar C Baycura	Dynamic architecture. Digital construction and negotiated architecture <i>An interview with Dr Rupert Soar, on new trends in biomimetic architecture. Part 3.</i>	http://www.youtube.com/watch?v=0a2GXiS9Cao	
J S Turner. 2010 C Baycura	Keeping a dry leaf <i>How leaves use a trick of surface tension to keep dry even in pouring rain.</i>	http://www.youtube.com/watch?v=hvsE_xbXVPac	http://itunes.apple.com/us/podcast/keeping-a-dry-leaf/id434386126?i=93476797
J S Turner. 2010.	Termite city. <i>Keith Ward's beautiful woodcuts from Alfred Emerson's book Termite City.</i>	http://www.youtube.com/watch?v=w9yg05SrXCc	

J S Turner. 2010 C Baycura	Brownian motion and Brownian motors <i>Brownian Motion, what it is, how it works, and why it matters to life</i>	http://www.youtube.com/watch?v=LqVeBxtZbj0	http://itunes.apple.com/us/podcast/brownian-motion-brownian-motors/id434386427?i=93470801
J S Turner. 2010.	Physics of rowing <i>How rowers use momentum to give them the racer's edge. Recorded on location at Cambridge University.</i>	http://www.youtube.com/watch?v=2EZwXOYgJAA&feature=relmfu	http://itunes.apple.com/us/podcast/physics-of-rowing/id380141288?i=93265478
J S Turner. 2010.	Speed of sound <i>Isaac Newton's original measurement of speed of sound, recreated where Newton himself did it, in Neville Court, Trinity College, Cambridge University.</i>	http://www.youtube.com/watch?v=PzUJ4G4uW18	http://itunes.apple.com/us/podcast/speed-of-sound/id434387094?i=93467116
J S Turner. 2010	Synthetic sound <i>Using a computer to explore the structure of sound.</i>	http://www.youtube.com/watch?v=yLgbSwAQj_E	http://itunes.apple.com/us/podcast/synthetic-sound/id434387094?i=93467118
J S Turner. 2010.	Gas thermodynamics <i>How the gas laws lead us to the second law of thermodynamics and life With a special appearance by Maxwell's Demon.</i>	http://www.youtube.com/watch?v=20dU_G0nl-o	http://itunes.apple.com/us/podcast/gas-thermodynamics/id434386427?i=93470802
J S Turner. 2010	Gases <i>Using a particle simulation to explain how motion of gas particles leads to large-scale phenomena like pressure.</i>	http://www.youtube.com/watch?v=uEar4s1ZG20	http://itunes.apple.com/us/podcast/gases/id434386427?i=93470800
J S Turner. 2010 C Baycura	Why don't trees fall down? <i>Why don't trees fall down? The answer will surprise you.</i>	http://www.youtube.com/watch?v=dyrKxSbi2GU	http://itunes.apple.com/us/podcast/why-dont-trees-fall-down/id380141288?i=93502851

J S Turner. 2010 C Baycura	The Doppler effect <i>How the mighty Kia can be used to demonstrate the behavior of sounds from moving bodies.</i>	http://www.youtube.com/watch?v=KPSN7ki3fmQ	http://itunes.apple.com/us/podcast/doppler/id434387094?i=93467119
J S Turner. 2010.	<i>Macrotermes</i> sampler. <i>Miscellaneous snippets of termite building, mound construction, the termite queen</i>	http://www.youtube.com/watch?v=o1xAG3kg7N8	
J S Turner. 2010	Endocasting <i>How the most detailed picture of the tunnel network in a termite mound was made. Featuring Rupert Soar</i>	http://www.youtube.com/watch?v=f0qdJh0YEAI	
J S Turner. 2010	Termite drinkers <i>Macrotermes termites have a complex water economy that is tied to the construction of their mounds. This can be observed with fluorescein dye</i>	http://www.youtube.com/watch?v=7AOKb0epOgk	
J S Turner. 2010	Cognitive trap demo <i>A simulated cognitive trap for termite swarms, based upon a mismatch between pheromone persistence and habituation time.</i>	http://www.youtube.com/watch?v=8Q8N4vRMgXM	
J S Turner. 2010	A swarm cognitive trap for <i>Macrotermes michaelsoni</i> <i>A termite swarm cognitive trap, involving self-organized circling behavior in a swarm</i>	http://www.youtube.com/watch?v=WJCVsHJMWSM	
J S Turner. 2010 C Baycura	Joints <i>Joints - How they're built and how they work.</i>	http://www.youtube.com/watch?v=u2S4jfoUDSw	http://itunes.apple.com/us/podcast/joints/id380141288?i=93502848
J S Turner. 2010 C Baycura	Bones <i>Measuring the material properties of bones by bending and breaking them in a big machine.</i>	http://www.youtube.com/watch?v=oDIR0VIKe0	
J S Turner. 2010 C Baycura	The frill is gone <i>How a basic understanding of fluid flow can tell us something about the biology of long-extinct animals, like the function of the frills of Triceratops.</i>	http://www.youtube.com/watch?v=KajHpHdZoAM	http://itunes.apple.com/us/podcast/the-frill-is-gone/id434386126?i=93476798

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

A Multiplicity of Memory. Toward a Coherent Theory of Adaptation. Biological Information—New Perspectives. Cornell University. June 2011.

Biology's Second Law. Evolution, Purpose and Desire. NASA Ames Research Center, Moffett Field, California. February 2011.

Fungal symbionts as mediators of water balance in *Macrotermes* colonies. Entomological Society of America Annual Meeting. San Diego, California. December 2010.

Emergent architecture in *Macrotermes* mounds. Wyss Institute, Harvard University. Cambridge, Massachusetts. October 2010. About 30 in attendance.

New Concepts in Termite-Inspired Design. Wyss Institute, Harvard University. Cambridge, Massachusetts. October 2010. About 100 in attendance.

New Concepts in Termite-Inspired Design. Center for Biologically Inspired Design, Georgia Tech University, and Perkins + Will Architects, Atlanta, Georgia. August 2010.

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

What is Life? Invited presentation to the Plenary session of International Board of Advisors meeting, John C Templeton Foundation. New York City. 8 June 2010. About 150 people in attendance.

V. PUBLIC SERVICE

A. Funded Service (include consulting activities)

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

Judge. Syracuse Academy of Science Science Fair.

2. Industrial and Commercial Groups, etc.

National Geographic Magazine, for forthcoming article on termites

Scholastic Magazine, for a forthcoming article on ant rafts

ScienceNOW, for a forthcoming article on ant rafts

BBC Natural History Unit, for an upcoming documentary on termites

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

Responsibility

Editorial board

Other (books, symposia, etc.)

b. Reviewer

<i>Journal(s)</i>	<i>No of manuscripts</i>
<i>Journal of Thermal Biology</i>	1
<i>Insectes Sociaux</i>	1
<i>Journal of Insect Science</i>	2
<i>Intelligent Buildings International</i>	1
<i>Biology and Philosophy</i>	1
<i>Animal Behaviour</i>	1
<i>Journal of Zoology</i>	1
<i>Journal of Experimental Biology</i>	2
<i>Harvard University Press</i>	1
Book proposal	
<i>Agency</i>	<i>No of proposals</i>
<i>John Templeton Foundation</i>	1
<i>National Science Foundation</i>	1
<i>National Geographic Society</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)

Namibia. April 2011. Field research

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

B. College-level

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 second time. Its enrollment exceeded the first year's enrollment, and to generally positive reviews. The model of online content has proven to be very popular, and in conjunction with the video production service of ITS, there is now a catalogue of roughly 60 videos available, which have continued to grow in quality and scope. These are outlined in the "Non-refereed publications" section of this annual report, with clickable links to the videos on ESF's YouTube channel and iTunesU outlet.
- 2 EFB 462 was offered again, with continued healthy enrollment.
- 3 I continued to make progress on my third book, begun when I was on sabbatical last year at Cambridge University. I have completed six chapters.
- 4 I had a very heavy writing schedule this year, with numerous invited manuscripts for edited book.
- 5 My work on termite architecture and biological design continues and continues to attract media attention. Some of these are outlined in the body of the report above.
- 6 I organized a "Creative Media Working Group" consisting of several faculty and staff on campus that are interested in developing ESF's presence as a major creator of online media.

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 intend to complete the manuscript of my third book by the end of the summer of 2011.
- 2 The coming year will be the third of the projected three-year program of online content development for EFB 200 Physics of Life. We expect to produce about another dozen videos.
- 3 I would like to stop teaching EFB 462 Animal Physiology, and to take over EFB's required course EFB 200 Evolution. That request has been pending since Fall semester 2010. I do not know its current status with the CCAC.
- 4 I will be continuing my ongoing research in termite colony structure and function in Namibia. There is one more year of support on my grant from the US Army Research Office.
- 5 I am developing three very promising collaborative ventures for further research in the broader implications of swarm intelligence in termites. Two involve collaborations with scientists at Harvard's Wyss Institute, one exploring swarm robotics, and the second involving novel mechanisms of gas exchange. The latter may expand the scope of field work to the Indian subcontinent. The third is a collaborative venture with one of the world's leading biomimetic architects, Mick Pearce, for a collaborative architectural research center in China.
- 6 I continue to try to persuade the College 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.

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2011
 - a. Course(s) to be offered
None
 - b. Proposed research activity
Ongoing work on US Army funded research in termites
Develop new research ventures (described above)
Complete book manuscript
Complete several invited book contributions
Continue development of *Physics of Life* series
 - c. University, professional society, and public service
2. Fall Semester 2011
 - a. Course(s) to be offered
EFB 200 Physics of Life
EFB 462/662 Animal Physiology
 - b. Proposed research activity
Continued research in Namibia
 - c. University, Professional society, and public service
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