

ANNUAL REPORT: June 1, 2016 – May 31, 2017
(i.e., Summer 2016, AY 2016-2017)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

*****PLEASE DO NOT INSERT TABLES FOR ANY CATEGORIES*****

NAME: Rebecca Rundell

Correction for Appendix A. "EFB faculty: Rank, Education, Interests":

Ph.D.: University of Chicago

M.S.: University of Chicago and University of Hawaii at Manoa

B.S.: Cornell University

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

Course No.	Title	Credit Hrs.	No. Students	No. of Lab. Sections
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SUMMER:

FALL:

SPRING:	311	Principles of Evolution	3	174	
	355	Invertebrate Zoology	4	40	2
	211	Diversity of Life II (10% of course)	3	189	

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.

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

Course No.	Title	Credit Hrs.	No. Students
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Fall 2016

420	Prof Internship/Envrn Biology		6
499	Honors Thesis/Project		1
899	Masters Thesis Research		1
999	Doctoral Thesis Research		3

Spring 2017

495	Undergrad Exp/College Teaching		5
498	Independent Research/Envrn Biology		1
499	Honors Thesis/Project		1
999	Doctoral Thesis Research		3

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

Evolution Discussion Group (postdocs, faculty, graduate, and undergraduate students from EFB and SU; average attendance of 12 attendees) co-organized with David Bullis*

* Graduate Student

4. Guest Lecture Activities

Invertebrate Zoology Graduate TA David Bullis (Rundell Lab) gave educational tours of our marine tanks to 189 **Diversity of Life II (EFB 211)** students

<u>Course No.</u>	<u>Title</u>	<u>No. of Lectures</u>
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II. STUDENT ADVISING

- A. Number of undergraduates for whom you are the student's official advisor 22 and unofficial advisor 2
- B. Graduate Students: (list 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

Mr. Tim Gervascio	B.S. with Honors (Degree Awarded May 2017)
Gervascio, T. 2017. Dating the terrestrial invasion of the Cyclophoroidea (Mollusca: Gastropoda) using the fossilized birth-death model. Honors Thesis. Bachelor of Science. Department of Environmental and Forest Biology, SUNY-ESF. May 2017.	

Ms. Cody Gilbertson	M.S. (Started August 2013; Degree Awarded Dec. 2016)
Gilbertson, C. 2016. Developing captive <i>ex situ</i> populations of the endangered Chittenango ovate amber snail <i>Novisuccinea chittenangoensis</i> (Succineidae: Pulmonata: Mollusca) for population augmentation in New York. Thesis. Master of Science. Department of Environmental and Forest Biology, SUNY-ESF. December 2016.	

Mr. Jesse Czekanski-Moir	Ph.D. (Started August 2014)
Ms. T. Rose Osborne	Ph.D. (Started August 2015)
Mr. David Bullis	Ph.D. (Started January 2016; Candidacy Earned May 2017)

CO-MAJOR PROFESSOR

MEMBER, STEERING COMMITTEE (other than those listed above)

Mr. Joshua Weber-Townsend	M.S., EFB (Degree Awarded May 2017)
Ms. Laura Porturas	M.S., Syracuse University Dept. of Biology

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

Ms. Ella Gray, M.S., Dept. of Forest and Natural Resource Management (Chair)

Ms. Emily Artruc, B.S. with Honors, EFB (Reader)

Artruc, Emily G. 2016. Growth rate and ecology of the giant heteromorphy ammonite *Diplomoceras maximum* using stable isotopes of accretionary shell carbonate. Honors Thesis. Bachelor of Science. Department of Environmental and Forest Biology, SUNY-ESF. Completed August 2016. (Reader)

III. RESEARCH COMPLETED OR UNDERWAY

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

- Belau land snail conservation, unsupported, 5%
- Diplomatid systematics and diversity with Jesse Czekanski-Moir* and T. Rose Osborne*, unsupported, 5%
- Collaboration with Dr. Mike Barker and Mr. Zheng Li* at the University of Arizona Dept. of Ecology and Evolutionary Biology on hexapod polyploidy, data collection supported by Barker's grant, 5%
- Collaboration with Jesse Czekanski-Moir* (SUNY-ESF), Dr. Mike Barker, Mr. Chris Reardon,** and Mr. Zheng Li* at the University of Arizona Dept. of Ecology and Evolutionary Biology on mollusc polyploidy (cephalopod project and gastropod project), data collection supported by Barker's grant, 5%
- Collaboration with Dr. Carl Christensen at Bishop Museum (Honolulu, Hawaii) on extinct Hawaiian *Carelia* land snail causes of extinction and rat predation project, unsupported, 5%
- Belau endodontoid evolution, biogeography and conservation with David Bullis*, 5%

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)

Rundell, R.J. (PI). U.S. Fish and Wildlife Service (USFWS) Endangered Species Great Lakes Restoration Initiative (GLRI), "Removing the threat of stochastic extinction for the Chittenango ovate amber snail: A collaborative captive propagation effort to develop *ex situ* population in New York State," \$90,000, 4/17/2017 – 2/28/2018. Supports EFB M.S. graduate Ms. Cody Gilbertson as Lead Research Technician (based at CIRTAS in EFB) and an EFB undergraduate as Assistant Technician (based at the Rosamond Gifford Zoo and CIRTAS). Volunteer EFB undergraduates are also trained by the Lead Research Technician under the grant.

Rundell, R.J. (PI) and Q. Wheeler (co-PI) National Science Foundation Collections in Support of Biological Research (CSBR). DBI-Biological Research Collections. Program Solicitation National Science Foundation 15-577. CSBR: Natural History: Securing, Expanding, and Making Accessible the Roosevelt Wild Life Collections at the State University of New York College of Environmental Science and Forestry. \$491,591. (6/1/2017-5/31/2019) Supports a graduate student Collections Assistant trainee in years 1 and 2.

Rundell, R.J. (PI). Institute of Museum and Library Services (IMLS) Museums for America Program. Submitted 30 November 2015. Roosevelt Wild Life Collections. \$118,694. (10/1/2016-9/30/2018) Supports a graduate student Collections Assistant trainee for one semester per year in years 1 and 2.

Student proposals (successful/active):

BEACON NSF Center for Evolution in Action and Society for the Study of Evolution Undergraduate Diversity at Evolution 2017 Grant (Alyssa Lau**)

Conchologists of America Research Grant (T. Rose Osborne*)

Lewis and Clark Fund for Exploration and Field Research, American Philosophical Society (T. Rose Osborne*)

Visiting Researcher Fund Award, Bernice P. Bishop Museum, Honolulu, HI (David Bullis*)

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

Rundell, R.J. (PI). ACE-CESU, U.S. Army Fort Drum Fish and Wildlife Management Program. Baselines and

barcodes: Developing land snails as indicator species on Fort Drum. \$73,815 requested. [Update from Program Manager Ray Rainbolt 5 April 2017: May have funding available for start on 1 September 2017 through August 2018.]

Green, Hyatt (PI), Schulz, K., Ringler, N., **Rundell, R.J.**, Smith A. (co-PIs). U.S. Environmental Protection Agency (EPA) Great Lakes Restoration Initiative (GLRI). Expansion of Great Lakes invertebrate barcode libraries. \$396,495 requested. (10/1/2017-9/30/2020)

Patterson, N. (PI), Hodkin, C. Ewell, Landis, C., Kimmerer, R., Giegerich, R.J., and **R. J. Rundell**. Seneca Nation. Seneca-Iroquois National Museum and Center for Native Peoples and the Environment at SUNY-ESF Partnership. \$21,160 requested. (5/1/2017-8/30/2018)

Graduate student proposals (pending):

Graduate Women in Science Fellowship Program (T. Rose Osborne*)

American Malacological Society Student Research Fellowship, Carriker Award (T. Rose Osborne*)

Unitas Malacologica Research Grant (T. Rose Osborne*)

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

Hayes, K.A., Meyer, W.M., Perez, K.E. (PIs), Yeung, N.W., **Rundell, R.J.**, Slapcinsky, J., Pearce, T.A., Vendetti, J.E. (co-PIs). National Science Foundation. Collaborative Research: ARTS. Pre-Proposal. Addressing the taxonomic impediment in North American land snails through integrative systematics research and training.

Graduate student research proposals (rejected):

National Science Foundation Graduate Research Fellowship Program (NSF-GRFP) (T. Rose Osborne*)

Ford Foundation Predoctoral Fellowship Program (T. Rose Osborne*)

National Defense Science and Engineering Graduate Fellowship Program (T. Rose Osborne*)

Society for the Study of Evolution Rosemary Grant Award (T. Rose Osborne*)

Sigma Xi Grant-in-Aid of Research (T. Rose Osborne*)

Society for Integrative and Comparative Biology Libbie Hyman Memorial Scholarship (T. Rose Osborne*)

* Graduate Student

** Undergraduate Student

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

Li, Z.,* Reardon, C.,** Kidder, T.,** **Rundell, R.J.**, and Barker, M.S. Submitted. Multiple whole genome duplications during the evolution of hexapods. *PNAS* [Previously submitted to *Nature*, *Science*, and *Science Advances*]

B. Non-refereed Publications

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

Czekanski-Moir, J.E.* and **R.J. Rundell**. Land snail patterns in Palau: Community assembly in a 14,000 year-old tropical forest fragmentation experiment. International Biogeography Society Meeting. Tucson, Arizona. Poster. 9-13 January 2017.

- Osborne, T.R.* and **R.J. Rundell**. 2017. Measuring biodiversity across ecological and geographic variables among diplommatinid land snails of Belau (Republic of Palau, Oceania). International Biogeography Society Meeting. Tucson, Arizona. Poster. 9-13 January 2017.
- R.J. Rundell**. 2017. Conservation and evolution of poorly known invertebrate animals. New York State Biotechnology Symposium. "Molecular Tools and Biodiversity." SUNY-ESF. Talk. 19 May 2017.
- Czekanski-Moir*, J.E., M. Barker, Z. Li*, **R.J. Rundell**, and C. Reardon*. 2017. Inferring ancient whole genome duplication events in the Mollusca. EvoDay: Phylogenomics. Cornell University. Talk. 11 May 2017.
- Lau, Alyssa**, J.E. Czekanski-Moir*, and **R.J. Rundell**. 2017. The synonymous and nonsynonymous substitution ratios (dN/dS) associated with habitat transitions in the Gastropoda. SUNY Undergraduate Research Conference West. SUNY Fredonia. Poster. 22 April 2017.
- Gervascio, Tim**, J.E. Czekanski-Moir*, and **R.J. Rundell**. 2017. Dating the terrestrial invasion of the Cyclophoroidea (Mollusca: Gastropoda) using the fossilized birth-death model. SUNY ESF Student Spotlight. Poster. 25 April 2017.
- Lau, Alyssa**, J.E. Czekanski-Moir*, and **R.J. Rundell**. 2017. The synonymous and nonsynonymous substitution ratios (dN/dS) associated with habitat transitions in the Gastropoda. SUNY ESF Student Spotlight. Poster. 25 April 2017.
- Osborne, T.R.* and **R.J. Rundell**. 2016. Testing the adaptive significance of body size in Belau's land snails. Evolution 2016 (the Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists). Austin, Texas. Talk. 17-21 June 2016.
- Czekanski-Moir, J.E.*, M. Barker, Z. Li, **R.J. Rundell**, and C. Reardon*. 2016. Inferring paleopolyploidy in the Mollusca. Evolution 2016 (the Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists). Austin, Texas. Talk. 17-21 June 2016.
- Li, Z.,* Reardon, C.,** Kidder, T.,** **Rundell, R.J.**, and Barker, M.S. 2016. Multiple whole genome duplications during the evolution of hexapods. Evolution 2016 (the Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists). Austin, Texas. Talk. 17-21 June 2016.

* Graduate student

** Undergraduate student

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

Rundell, R.J. 2016. Diversification and conservation of Belau land snails (Republic of Palau, Oceania). University of Rochester Department of Biology Seminar Series. University of Rochester (Rochester, NY). 28 October 2016. (Invited Seminar; 20 attendees)

Rundell, R.J. 2016. Evolution and conservation in land snails: Pacific islands to New York State. Asa Gray Biological Society Seminar Series. Utica College (Utica, NY). 7 November 2016. (Invited Seminar; 50 attendees)

SUNY-ESF Darwin-Wallace Day/International Darwin Day Poster Event at Moon Library. Feb. 16-March 10, 2017. (400 attendees)

V. PUBLIC SERVICE

A. Funded Service (include consulting activities)

1. Government Agencies (Federal, State, Local):
2. Industrial and Commercial Groups, etc.

Sotheby's. Consult on conservation status (CITES, etc.) for art objects and artifacts that include invertebrates

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

Representative-at-Large, Board of Directors. Natural Science Collections Alliance (part of the American Institute of Biological Sciences (AIBS)) (Term: 3 years beginning Fall 2014). [The NSC Alliance is a national organization that influences policies and resources for institutions that house collections (e.g. connecting to congress, NSF and other agencies.) Participated in Board of Directors meetings. Contributed to governmental advocacy, visioning, mission statement and strategic planning for the organization and represented university Collections, particularly small university Collections.

Provide land snail ecology, taxonomy, and field expertise and field supplies to **Island Conservation** [Island Conservation is an NGO that works to prevent extinctions by removing invasive species from islands.]

VI. PROFESSIONAL DEVELOPMENT

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

Research Associate, Carnegie Museum of Natural History, Pittsburgh, PA (renewed annual terms, beginning late Spring 2015)

Research Associate, Paleontological Research Institution, Ithaca, New York (3-yr term beginning January 2015)

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

Member and Specialist, IUCN (International Union for Conservation of Nature) Species Survival Commission, Molluscs

2. Professional Society Membership

American Malacological Society
Paleontological Research Institution
Society for the Study of Evolution

3. Other Professional Activities

a. Editorial activity

Journal (s)

Responsibility

Malacologia

Associate Editor

Other (books, symposia, etc.)

b. Reviewer

Journal(s)

No. of manuscripts

Biological Journal of the Linnean Society 1
Molecular Biology and Evolution 1

Agency No. of proposals

National Science Foundation CAREER 1

Other

c. Participation (workshops, symposia, etc.)

Name of workshop, etc. Date Place

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

Visiting Researcher at the Bernice P. Bishop Museum (Honolulu, Hawaii) with EFB Ph.D. student David Bullis.* Mentored Bullis in museum techniques and curation, and Pacific island land snail biogeography, systematics, evolution, and conservation. (8-21 November 2016)

Arranged **high resolution micro-CT training session at the Cornell University Institute of Biotechnology Imaging Facility** (Ithaca, NY) with CT Manager Teresa Porri. Participating students: Jesse Czekanski-Moir*, T. Rose Osborne*, David Bullis*, and Tim Gervascio.** (22 November 2016)

Hosted **University of Rochester evo-devo researchers Longjun Wu and Adam Johnson** for two days of mutual lecturing and interaction with Rundell Lab on animal evolution and development, including evo-devo approaches to understanding the molluscan shell and ciliary bands in lophotrochozoans. (30-31 March 2017)

Worked with **Paleontological Research Institution** Director Dr. Warren Allmon on planning of upcoming Smith Woods BioBlitz and a collaboration with David Bullis* resulting in the following publication:
Allmon, W.D., M.P. Pritts, P.L. Marks, B.P. Epstein, D.A. Bullis*, and K.A. Jordan. 2017. *Smith Woods: The Environmental History of an Old Growth Forest Remnant in Central New York State*. Paleontological Research Institution Special Publication No. 52. Cayuga Press, Cortland, New York. 208 p.

Participated in **Cornell University's EvoDay on Phylogenomics**, bringing along students Alyssa Lau**, Tim Gervascio**, T. Rose Osborne*, and Jesse Czekanski-Moir* (Jesse Czekanski-Moir also gave a well-received talk). Students discussed their research and future careers with area evolutionary biologists. (11 May 2017)

Ph.D. student Jesse Czekanski-Moir* and Alyssa Lau** visited the Amber Collections at the **American Museum of Natural History** (New York City, NY) and met with Curator Dr. David Grimaldi to examine and discuss land snails in amber. (25 May 2017)

* Graduate student

** Undergraduate student

D. Foreign Travel (Where, When, Purpose)

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

Head Curator, Roosevelt Wild Life Collections (development, planning and oversight of Collections)

Worked with Roosevelt Wild Life Collections Manager Ron Giegerich on plans for permitting, acquisition, preparation and curation of vertebrate specimens.

Supervised Roosevelt Wild Life Collections Assistant in developing and implementing Specify database for RWLC

Worked extensively with architects (QPK) and Brian Boothroyd on new museum building and associated classroom design and materials, planning, safety, and workflow

Leadership committee of the Roosevelt Wild Life Station, contributing to e.g. visioning, strategic planning and providing Collections expertise

Scientist-in-Residence and Roosevelt Invertebrate Zoologist, Roosevelt Wild Life Station, SUNY-ESF

EFB Herbarium Remounting Project, co-supervisor (with Dr. Alex Weir); handled isolation of pesticide issues in herbarium in Fall 2016

Biotechnology Major Committee

Provide mentoring to undergraduate students in the Marine Biology Minor led by Dr. Kim Schulz

EFB prospective student open house (Conservation Biology Major Representative). Gave educational tours of Roosevelt Wild Life Collections whale bone room to parents and prospective students. 29 October 2016

B. College-level

Facilitated loan and preparation of Lonesome George Galápagos tortoise specimen with James Gibbs and Galápagos Conservancy

Photographed Lonesome George Galápagos tortoise specimen for archival purposes, both during entire preparation process, and post-preparation. Also facilitated additional promotional footage through ESF Communications Office.

Contributed to official report for the Ecuadorian government on Lonesome George Galápagos tortoise specimen; provided input related to the specimen and helped facilitate visit from Galápagos Conservancy President.

Roosevelt Wild Life Collections Education and Research Center exhibit planning and design (with Dr. James Gibbs)

Roosevelt Wild Life Collections Education and Research Center Building Design and Architecture, as well as advising on equipment needs and specifications

Roosevelt Wild Life Station Collections Committee (leadership of Honorary Advisory Council members)

Provided input on Half-Earth proposal to MacArthur Foundation (Sept. 2016)

Destiny USA, Traveling and Other Exhibit Explorations (donors, specimen acquisition, design, and implementation)

The Revelator environmental news site (Center for Biological Diversity; therevelator.org): Invited by editor John Platt to contribute essays and issues

Rundell Lab (EFB, Illick Hall) hosts President Quentin Wheeler's remotely operable digital microscope to facilitate global cybertaxonomy

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 (i.e., three paragraphs total) 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 (when available), which I'll continue to award based on your contributions to the department and college this reporting period.

Students: Acceptance of evolution among United States citizens is low compared to other industrialized nations (the U.S. is in the mid-to-upper-40% range vs. 80% in Japan and northern Europe; Miller, Scott and Okamoto, 2006). ESF biology students can play an important role in using and disseminating evolutionary knowledge in their careers both in formal and informal contexts. No matter incoming experience and interest level, students need to leave the course with a working understanding of evolutionary biology. This year in collaboration with my graduate TA Jesse Czekanski-Moir we developed a short online test to be administered upon entering the course and again after completing the course, including questions from both the challenging and more basic ends of the spectrum (the latter being more readily Google-able). Students entering the course got an average of 9/16 questions correct. Students leaving the course got an average of 12.5/16 questions correct. Here is one sample question: "Which of the following is *not* a potential agent of selection? (check all that apply): A. Humans going fishing. B. Genetic drift. C. Annual flooding in the area surrounding a river." After having taken my course, twice as many students chose the correct answer (B) as had done so in the pre-test.

I also think each student should leave the course with a working knowledge of the span of deep time as well as humans' relatively minor place in geological time. Based on students' answers in previous exam questions, this remains a surprisingly resistant area within the brains of even our fairly enlightened and purportedly non-human-centric ESF biology student population. Given the outdoorsy orientation of much of our student body and the potential effectiveness of hands-on teaching methods, I choose to imbue students with a visceral, hands-on sense of time scale through field experience. Each student in the course digs and discovers his or her own Middle Devonian fossils during a field trip, which this year involved 30 deg. F foggy weather with ice and snow on the outcrops. ESF students are tough (and like to be perceived as such!), and always relish this field paleontology experience. While some students have casually looked for fossils before, most cannot recognize a crinoid or brachiopod (or understand the age of the rocks they stand on and their depositional environment) until they have had this hands-on experience with me. After the dig, students tour a world-class museum in our own backyard (the Museum of the Earth in Ithaca, NY) and get additional hands-on time with fossils during a special program with museum paleontologist Dr. Rob Ross. In evaluations, many students report the field trip as an important and beloved part of the course.

Reading *Why Evolution is True* is complementary to the field experience, since it gives students practical verbal tools for disseminating evolutionary knowledge themselves. At the end of the course students then have the opportunity to ask direct questions to the author, Dr. Jerry Coyne via a live in-class Skype chat. Guest lectures on cutting edge evo-devo research (Longjun Wu, University of Rochester) and kin selection and eusociality (Jesse Czekanski-Moir, evolutionary biologist in my lab, Graduate TA and ant expert) further enhanced the course. Students also work in pairs to read evolution research from the past year and create posters explaining this research to a general, educated audience. Students must choose several relevant evolution keywords to explain in the context of their poster. This exercise, which occurs at the beginning of the course (around Darwin Day, Feb. 12) serves to introduce them to a topic they might not yet have encountered, giving them a window into the broader field that will be explored in more detail later in the course. When the posters are displayed for the public *en masse*, it also delivers a powerful message that evolution research, and evolution itself, is modern and ongoing. Rather than a controversial topic we much shy away from, evolution plays a central role in all of biology, in their lives, and in students' future careers. This year we

topped off this 174-student course with a tour and hands-on experience with whale bones in rooms on the first floor of Illick, following my lecture on whale evolution in Marshall Auditorium. Until our whales are articulated and hung, I hope to continue this well-received unit of the course. I make a point to bring relevant specimens to class when possible (e.g. 300 Ma plant nodules from Mazon Creek; dinosaur bone; owl flight feathers), since they not only keep students interested, but improve recall of certain concepts. I hope to find ways to better integrate this 3D element into a large traditional lecture hall; Powerpoint and videos are limiting. But consistent specimen use is not straightforward for large, fragile or valuable specimens that cannot be passed around. I also aim to build teaching collections (live and dead) that would best support the concepts I teach. With the proper context, specimens can be straightforward to employ for teaching the history of life on Earth or adaptations (and students remember these examples), but students would also benefit from additional tangible “bookmarks” for concepts they struggle with, such as gene flow. As I work to make the Roosevelt Wild Life Collections more accessible through our new campus Center (see “Dept./College” below), I plan to create additional opportunities for student-specimen interaction for enhancing understanding of abstract concepts.

My Invertebrate Zoology continues to be a hit, and around registration time this year I had more than a dozen extra students clamoring to get into the course. Students respond well to the combination of approaches I use in the course, including drawing and color-coding diagrams to understand the fates of animal germ layers, using phylogeny as an organizational framework, viewing short video clips to understand behavior and ecology, and discussing the conservation relevance of invertebrate animals, including echinoderms, corals, glass sponges, sea mount organisms, animals central to international fisheries, and tropical land snails. In lab we maintain a large cold water touch tank with a live abalone, sea urchins, hermit crabs, and anemones, and temperate tanks with ctenophores, jellyfish and horseshoe crabs. Since many invertebrates do not preserve well, live animal observations are essential to understanding form and function. Each student also dissects an assortment of invertebrate animals, the favorites being the sea urchin (students keep their Aristotle’s lantern and bring it home in a jar), and the fresh squid (which includes my calamari recipe that they can use to cook the remains of the mantle at home). The effort I’ve made in refining the organization of the lab and lecture over the past few years has paid off in terms of student learning outcomes and evaluations. Students are learning a large amount of challenging information, and it showed in their midterm and final exams, as well as their consistent participation in class and good questions during lecture. Student comments show the work was worthwhile, e.g.: “Enthusiastic teaching made 8 a.m. feel more like 9:30” and “I really love invertebrates now! I didn’t care so much to take this course but I’m glad I did.”

Department/College: I work with the Roosevelt Wild Life Station (RWLS) as the Head Curator of the Roosevelt Wild Life Collections (RWLC). In this capacity I have been fortunate to work with RWLS leaders Drs. James Gibbs and Jacqui Frair as well as long-serving Collections Manager Ronald Giegerich. As any of RWLS’s team of Scientists-in-Residence can attest there is no shortage of responsibilities within RWLS, nor ideas for helping the Station evolve in its important role for the College. The Roosevelt Wild Life Collections are particularly important to everything we do as a department and college, since they directly support our substantial natural history education and research foci, strengths that ultimately benefit the agencies, institutions and companies in which ESF students will become leaders. As RWLC Head Curator the main role I played in serving the department and college this year was in bringing in two large grants from the National Science Foundation (co-PI: President Wheeler) and the Institute of Museum and Library Services to help complete the new Roosevelt Wild Life Collections Research and Education Center in the lower level of the Gateway Building. These grants were fully funded (\$610,285 total) and leverage an award of \$2M made to the College under President Wheeler by the State of New York. By saving, expanding, and making accessible the RWLC within a Roosevelt Wild Life Collections Research and Education Center, we will foster a deep connection between natural history collections and our future environmental leaders. Hundreds of ESF students will take classes in the Center each year. NSF and IMLS support will enable us to resolve current collections conservation problems created by inadequate collections housing and to directly involve students in the process. This new Center will communicate the centrality of authentic specimens in both natural history education and research, and its presence on campus will help ESF emerge as a leader in organismal and natural history education—areas of growing relevance (see Frazer 2016, *Scientific American*: “80 Percent of Environmental Scientists Could Use More Natural History Training”) that have been departmental and college strengths for ESF’s entire history. A substantial part of bringing this Center to fruition has been working closely with Brian Boothroyd, engineers, and architectural firm QPK as well as other experts and vendors in the planning and design process. I have brought my collections, field and laboratory research, and natural history teaching expertise to bear on these technical aspects of the project. I have also worked with a Wildlife Science undergraduate student to help bring our Collections data into the modern century by

developing the open-access Specify database for use with our bird and mammal Collections. I continue to work very closely with Ronald Giegerich in his acquisition and management of Collections to benefit both research and teaching in the department. One of the most exciting projects in Collections this year was working with Giegerich, Gibbs, and the Galápagos Conservancy in the loan, careful preparation and documentation of the skeleton of the Galápagos tortoise Lonesome George. We were also honored by a department visit from the President of the Galápagos Conservancy and the opportunity to prepare a detailed report on Lonesome George's remains for the Government of Ecuador, which holds Lonesome George's remains sacred.

Self: Developing my lab and mentoring graduate and undergraduate students has been one of my biggest commitments this year. The lab has hit a critical mass of passionate and productive students, which has fostered intense and rewarding collaborations centered around conservation, evolution, macroecology, and biogeography of molluscs and other invertebrate animals. My student Ms. Cody Gilbertson graduated with an M.S. in Conservation Biology and a thesis, publication, and job as Lead Research Technician in my lab, working on my new Chittenango ovate amber snail grant (USFWS), which is bringing a second population of rare snails into being through a partnership with the Rosamond Gifford Zoo, State Parks, DEC and USFWS (Officer Robyn Niver). Establishing a second population of endangered snails at another locality is a difficult and risky process that has succeeded elsewhere in the world in just a couple cases—and so far our attempt is working. We will also continue to maintain our population at CIRTAS, thanks to CIRTAS Director Dr. Kim Schulz.

Ph.D. students Mr. Jesse Czekanski-Moir and Ms. T. Rose Osborne both gave two well-received talks at two different large international meetings: Evolution 2016 in Austin, Texas (the Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists) and the International Biogeography Society Meeting in Tucson, Arizona. I also co-authored a presentation on whole genome duplication in hexapods at Evolution 2016. T. Rose Osborne won a Best Speed Talk Award at the American Museum of Natural History Student Conference in Conservation Science in New York City. Ph.D. student David Bullis earned Candidacy this year, co-authored a book (*Smith Woods: The Environmental History of an Old Growth Forest Remnant in Central New York State*) that will foster an upcoming BioBlitz in Smith Woods this September (with the invertebrate component led by Rundell Lab), and received funding to travel to the Bernice P. Bishop Museum in Honolulu, Hawaii a second time to work there as a visiting scientist. This work is a follow up to my mentoring and research trip with Bullis last year, where David pursued imaging and other curatorial work on rare Pacific endodontoid land snails, and I pursued collections-based research on the incidence of rat predation in extinct Hawaiian *Carelia* land snails. Other student funds received in my lab include Osborne's grants from the Lewis and Clark Fund for Exploration and Field Research (American Philosophical Society), and the Conchologists of America Research Grant. Undergraduate researcher in my lab (Ms. Alyssa Lau) was awarded a BEACON NSF Center for Evolution in Action and Society for the Study of Evolution Undergraduate Diversity at Evolution 2017 Grant in order to present her work this year at Evolution 2017 in Portland, Oregon. Ms. Lau graduated in May and presented her work both at the Student Spotlight and the SUNY Undergraduate Research Conference West at SUNY Fredonia. Another undergraduate researcher in my lab, Mr. Tim Gervascio, graduated with Honors this year upon completion of his thesis, which he will also present at Evolution 2017, and which we will prepare for publication.

Fostering strong education, collaboration and challenges in evolutionary biology among this bright and dynamic team of students (and bringing additional undergraduates into the fold) has been a priority for me. To this end, we have engaged our graduate and undergraduate students with projects and experiences at the Bernice T. Bishop Museum (Honolulu, HI), the American Museum of Natural History, the Cornell University Institute of Biotechnology Imaging Facility, the Paleontological Research Institution (Ithaca, NY), and Cornell University's EvoDay on Phylogenomics (where Czekanski-Moir gave an invited talk on whole genome duplication in molluscs that was well-received). Our lab also hosted University of Rochester evo-devo researchers Longjun Wu and Adam Johnson for a two-day-long lab exchange where everyone gave talks and discussed research directions. Rundell Lab students themselves have also played important academic leadership roles: Osborne has spearheaded our whole-lab collaboration on the evolution of terrestriality in snails; Czekanski-Moir has developed a frontier-pushing collaboration on mollusc polyploidy with my colleagues at the University of Arizona, developed novel instructional approaches in evolutionary biology in EFB311, and engaged undergraduate students in evolutionary biology in our lab; and Bullis has helped organize the weekly Evolution Discussion Group that is well-attended by faculty, graduate and undergraduate students at ESF and Syracuse University. I am also extremely proud of the course evaluations both Ph.D. students Jesse Czekanski-Moir (Evolution) and David Bullis (Invertebrate Zoology) received this year, which are indicative of what outstanding teachers they will

be in their future careers. Students rank them as their favorite TAs at ESF: knowledgeable, approachable, encouraging, and conscientious. Czekanski-Moir has also excelled in individual mentoring of undergraduates in evolutionary biology and is taking a leadership role in developing our upcoming ESF International Course on the Evolution, Ecology, Biogeography, and Conservation of Invertebrates in the Republic of Palau. This course will be the first of its kind in Palau.

In addition to collaborative research with students, I was invited to give seminars this year at the University of Rochester (faculty and graduate students in the Dept. of Biology), and Utica College (Asa Gray Biological Society Seminar Series). Discussions with evolutionary biologists at the University of Rochester were particularly rewarding, and I also had the opportunity to tour their extensive collections of vertebrate specimens originally from Ward's, including narwhal tusks and an articulated gorilla skeleton. This year I also strengthened a collaboration with Island Conservation (IC), which is planning rat eradications on several islands in Belau (Republic of Palau, Oceania). Because past research has shown that not just birds, but invertebrates might benefit from rat removal, I worked with IC to ensure the collection of baseline data for the first island of Ngeanges, arranging logistics and equipment here at ESF and communicating with colleagues in Belau to implement the work. We are now sorting through the specimens obtained. This is a large-scale field experiment that stands to inform conservation of some of the most endangered animals on Earth, particularly endemic partulid tree snails and helicarionids. While at the Bishop Museum as Visiting Researcher, I also engaged IC staff (including my Ph.D. student David Bullis) in a meeting to discuss future research and conservation management directions between our groups and involving land snails more generally. I have also continued by role as Associate Editor for the journal *Malacologia* and have been invited by the editor to contribute to the new environmental news site *The Revelator* (Center for Biological Diversity). I continue several writing projects on the conservation and evolution of Pacific island land snails that will accelerate into the summer.

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)

Self:

I plan to focus on writing manuscripts and mentoring graduate and undergraduate researchers. I plan to use the next series of papers as the foundation for a book on land snail evolution and conservation.

Department:

I plan to continue my strong contribution to Collections at the College and Department levels. The focus for the coming year is making ESF's Roosevelt Wild Life Collections Research and Education Center a reality. Thus far this has involved intense preparation, long and often quite technical meetings with architects and engineers, and navigation of a complex pre-bid process, as well as motivating and participating in the creative design and implementation of new types of teaching and research spaces on campus, which stand to transform our department and college's ability to deliver a world-class biology education to our undergraduate and graduate students.

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2017

a. Course(s) to be offered

b. Proposed research activity

- Czekanski-Moir, J.E.* and **R.J. Rundell**. 2017. Modeling community phylogenetic structure in adaptive and nonadaptive radiations. *Evolution 2017: Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists*. Talk. 23-27 June 2017.
- Gervascio, Tim**, J.E. Czekanski-Moir*, and **R.J. Rundell**. 2017. Dating the terrestrial invasion of the Cyclophoroidea (Mollusca: Gastropoda) using the fossilized birth-death model. *Evolution 2017: Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists*. Poster. 23-27 June 2017.
- Lau, Alyssa**, J.E. Czekanski-Moir*, and **R.J. Rundell**. 2017. The synonymous and nonsynonymous substitution ratios (dN/dS) associated with habitat transitions in the Gastropoda. *Evolution 2017: Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists*. Poster. 23-27 June 2017.
- Osborne, T.R.*, D. Bullis*, J.E. Czekanski-Moir*, T. Gervascio**, A. Lau** and **R.J. Rundell**. 2017 Major habitat transitions within the Class Gastropoda. *Evolution 2017: Annual Meeting of the Society for the Study of Evolution, American Society of Naturalists, and the Society of Systematic Biologists*. Talk. 23-27 June 2017.

Writing projects (manuscripts):

Rundell, R.J. Characterizing the Pacific island land snail conservation crisis: Extinction threat and survival in the lowland rainforest land snails of the Belau archipelago. *Conservation Biology*

Rundell, R.J. and J.E. Czekanski-Moir*. Endless forms most icky: The success of the simple and small as integral to a biologically sound pedagogy. *BioScience*

Rundell, R.J. and C.C. Christensen. Causes of extinction in an extinct Hawaiian land snail: Rat predation and *Carelia*. *Diversity and Distributions*

C.R. Gilbertson* and R.J. Rundell. Conservation of the Chittenango ovate amber snail. *Conservation Biology*

Gervascio, Tim**, J.E. Czekanski-Moir*, and R.J. Rundell. 2017. Dating the terrestrial invasion of the Cyclophoroidea (Mollusca: Gastropoda) using the fossilized birth-death model.

Research in progress:

Developing new population of Chittenango ovate amber snail at the Rosamond Gifford Zoo and associated conservation research collaboration with Lead Research Technician Ms. Cody Gilbertson (ESF) and Univ. of Rochester Veterinarian & Professor Jeff Wyatt (and partners USFWS, DEC and Chittenango Falls State Park)

Collaboration with Ph.D. Student Jesse Czekanski-Moir, Dr. Mike Barker, Mr. Zheng Li and Mr. Chris Reardon (University of Arizona) on animal polyploidy research

Collaboration with M.S. student David Bullis on Belau endodontoid land snail evolution and conservation research

c. University, professional society, and public service

Graduate students and two undergraduate researchers in the lab attend Society for the Study of Evolution/American Society of Naturalists Annual Meeting in Portland, Oregon (undergraduate Alyssa Lau funded by NSF Undergraduate Diversity Award)

Head Curator for the Roosevelt Wild Life Collections, Collections Committee for Roosevelt Wild Life Collections

Leadership team for Roosevelt Wild Life Station

EFB Herbarium Remounting Project Supervision

Malacologia Associate Editor

Representative-at-Large, Board of Directors. Natural Science Collections Alliance (part of the American Institute of Biological Sciences (AIBS))

2. Fall Semester 2017

a. Course(s) to be offered

Continue Evolution Discussion Group (informal reading group with ESF and SU students and faculty), co-led with a selected graduate student from the Rundell Lab

b. Proposed research activity

Czekanski-Moir, J.E.* and R.J. Rundell. The ecology of nonadaptive radiation. *Trends in Ecology and Evolution*

Welcoming two new graduate students to the lab:

- **Ms. Emlyn Clark, M.P.S. in Conservation Biology**, EFB [Emlyn is interested in evolutionary biology, and has worked in my lab on two research projects]

- **Mr. Joseph Makaure, Ph.D. in Conservation Biology**, EFB (co-advised with Dr. Don Stewart) [Joseph is an exceptional Fulbright student from Zimbabwe. He has significant experience with freshwater fishes there, and stands to become one of the only ichthyologists ever known from the country. Part of his research will involve phylogenetics, biogeography, and conservation of the fish group of his choice.]

continuation of above (1b.)

c. University, Professional society, and public service

Head Curator, Roosevelt Wild Life Collections (development, planning and oversight of Collections);

Leadership committee of RWLS, contributing to e.g. Visioning and Strategic Planning

Biotechnology Major Committee

Destiny USA, Traveling and Other Exhibit Explorations (donors, specimen acquisition, design, and implementation)

Roosevelt Wild Life Education and Research Center Planning and Architecture

Roosevelt Wild Life Station Collections Committee (leadership of Honorary Advisory Council members)

Malacologia Associate Editor

Representative-at-Large, Board of Directors. Natural Science Collections Alliance (part of the American Institute of Biological Sciences (AIBS))

3. Spring Semester 2018

a. Course(s) to be offered

New Course through ESF International Academic Program: J.E. Czekanski-Moir* and R.J. Rundell (Instructors):

“Evolution, Ecology and Conservation of Invertebrates in the Republic of Palau, Oceania” (3 credits; discussion of readings in Spring Semester; field component in May-early June 2018)

311	Principles of Evolution	3
355	Invertebrate Zoology	4
796	Invertebrate Zoology	4
211	Diversity of Life (10% of course)	3

International course on the Evolution, Ecology, Biogeography, and Conservation of Invertebrates in the Republic of Palau

b. Proposed research activity

continue 1b. as possible

c. University, professional society, and public service

Rundell, R.J. 2018. Evolution, biogeography and conservation of the land snails of Belau (Micronesia, Oceania). Department of Ecology, Evolution and Organismal Biology Seminar, Iowa State University (Ames, Iowa). 12 April 2018 (Invited Talk).

Head Curator, Roosevelt Wild Life Collections (development, planning and oversight of Collections);

Leadership committee of RWLS, contributing to e.g. Visioning and Strategic Planning

Biotechnology Major Committee

Destiny USA, Traveling and Other Exhibit Explorations (donors, specimen acquisition, design, and implementation)

Roosevelt Wild Life Education and Research Center Planning and Architecture

Roosevelt Wild Life Station Collections Committee (leadership of Honorary Advisory Council members)

Malacologia Associate Editor

Representative-at-Large, Board of Directors. Natural Science Collections Alliance (part of the American Institute of Biological Sciences (AIBS)): Collections advocacy in new political climate; related interaction with NSF in support of collections funding, including small university collections.