

ANNUAL REPORT: June 1, 2013 – May 31, 2014
(i.e., Summer 2013, AY 2013-2014)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

NAME: Lee Newman

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

| | <u>Course No.</u> | <u>Title</u> | <u>Credit Hrs.</u> | <u>No. Students</u> | <u>No. of Lab. Sections</u> |
|---------|-------------------|----------------------|--------------------|---------------------|-----------------------------|
| SUMMER: | No courses taught | | | | |
| FALL: | BTC 401 | Molecular Techniques | 4 | 25 | 2 |
| | EFB 601 | Molecular Techniques | 4 | 5 | 1 |
| SPRING: | EFB 325 | Cell Biology | 3 | 89 | 0 |
| | BTC 499 | Senior Synthesis | 1 | 21 | 0 |
| | Co-Teach | | | | |
| | EFB 202 | Diversity of Life | 3 | | 6 |

NOTE: PLEASE INDICATE WHICH COURSE(S) HAD A SERVICE-LEARNING COMPONENT AND BRIEFLY EXPLAIN THE NATURE OF THIS COMPONENT.

No classes had a service-learning component

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

| | <u>Course No.</u> | <u>Title</u> | <u>Credit Hrs.</u> | <u>No. Students</u> |
|---------|-------------------|---|--------------------|---------------------|
| FALL: | EFB 798 | Research Problems in Envir. and For. Bio. | | 1 |
| | EFB 999 | Doctoral Thesis Research | | 3 |
| | EFB 899 | Master's Thesis Research | | 3 |
| | EFB 495 | Undergrad Exp/ College Teaching | | 3 |
| | EFB 298 | Research Apprenticeship | | 3 |
| | BTC 498 | Research Problems in Biotechnology | | 8 |
| | BTC 420 | Internship in Biotechnology | | 7 |
| | BTF 298 | Research Apprenticeship | | 1 |
| | EFB496/796 | Plant Physiology Recitation | | 8 |
| SPRING: | EFB 999 | Doctoral Thesis Research | | 4 |
| | EFB 899 | Master's Thesis Research | | 3 |
| | EFB 495 | Undergrad Exp/ College Teaching | | 1 |
| | BTC 498 | Research Problems in Biotechnology | | 8 |
| | EFB 498 | Research Problems in Envir. For. Bio | | 1 |
| | EFB 496/796 | Phytoremediation | | 16 |
| | BTC 420 | Internship in Biotechnology | | 4 |
| | EFB 496/796 | Cell Biology Recitation | | 5 |
| | BTC 298 | Research Apprenticeship | | 1 |
| | EFB 420 | Internship in Envir. For. Bio. | | 1 |
| | EFB 496 | Study Abroad | | 1 |

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

None at this time

4. Guest Lecture Activities

| <u>Course No.</u> | <u>Title</u> | <u>No. of Lectures</u> |
|-------------------|---------------------------------|------------------------|
| BTC 132 | Orientation Seminar | 1 |
| EFB 132 | Orientation Seminar | 1 |
| ENS 132 | Orientation Seminar | 1 |
| CIE 472 | Applied and Environmental Micro | 1 |

II. STUDENT ADVISING

A. Number of undergraduates for whom you are the student's official advisor 29 and unofficial advisor 8

Over the course of the past year I have had 18 undergraduate students (8 of whom I am academic advisors to) who are conducting research in my laboratory:

| | | |
|------------------|----------------|----------------|
| Beverly Agtuca | Sean Hohm | Shaler Garrett |
| Joseph Whitaker | Devyn Speer | Chet Lynch |
| Matthew Purdy | Emily Taff | Rachel Snyder |
| Logan Will | Erika Thomas | Chunying Liu |
| John Quattrocchi | Michael Tubbs | Vic Maietta |
| Laura Sorenson | Arthur Hermano | Mike Leclair |

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

| | | |
|-----------------|-----|--------------|
| Adam Hoffman | PhD | August 2010 |
| Wenjun Cai | PhD | August 2011 |
| Funmi Afelumo | MS | January 2013 |
| Justin McMullen | MS | January 2013 |
| Dan Collins | PhD | August 2012 |
| Camille Warner | PhD | August 2012 |

CO-MAJOR PROFESSOR

| | | |
|------------------------------|-----|-------------|
| Co-Advising with Ted Endreny | | |
| Scott Wolcott | PhD | August 2012 |

VISTING STUDENTS

| | | |
|---------------|---|----------|
| Jirwana Torit | King Mongkut's University of Technology | Thailand |
| Azam Nori | Tarbiat Modares University | Iran |
| Beynan Ransom | SUNY University of Buffalo | USA |

MEMBER, STEERING COMMITTEE (other than those listed above)

| | |
|-------------------|-----------------|
| Allison Oaks | Jessica Saville |
| Leticia Izquierdo | Grete Bader |
| Brandon Haynes | |

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

YunYun Bi
Cheryl Bondi
Reza Khatami

***C. Post Graduates

POST DOCTORAL FELLOW

Azam Nori Tarbiat Modares University Iran

VISITING SCHOLAR

Ruilian Sun Shandong University China

III. RESEARCH COMPLETED OR UNDERWAY

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

| | |
|---|---|
| Safeners and metal toxicity protection | 4 |
| Role of plant endophytes on growth promotion | 4 |
| Role of P450 genes in TCE degradation | 4 |
| We submitted an NSF grant in February for this project. | |
| Impact of nanoparticles phyllosphere organisms | 4 |
| Impact of nanoparticles on epidermal symbiotes | 4 |
| Horticultural Therapy | 8 |
| Wastewater treatment walls | 4 |
| Mine site restoration | 4 |

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)

| | | |
|----------------------------------|--|-----------------|
| USDA | Nanoparticle Contamination of Agricultural Crop Species | co-PI/PI on ESF |
| \$1,498,080 | \$381,026 \$75,613 | Wenjun Cai |
| | Mar 11-Mar 16 | |
| NASA | Development of Hyperspectral Imaging of Plants to Detect Contamination | PI |
| \$307,348 | \$99,519 | Adam Hoffman |
| | Mar 11-Mar15 | |
| NSF | Plant Uptake and Interaction with Nanoparticles PI | |
| \$297,907 | \$94,878 | Justin McMullen |
| | Sept 08–Sept 14 | Azam Nori |
| Roux Assoc | Treatment Wetlands for TCE Degradation | PI |
| \$12,000 | \$12,000 | Camille Warner |
| | May 13-May 14 | |
| Gifford Foundation | Construction Funds for Horticultural Therapy | PI |
| \$1000 | \$1000 | |
| | June 13 – Sept 14 | |
| American Legion Ladies Auxillary | Funds for Horticultural Therapy | PI |
| \$2500 | \$2500 | |
| | May 13- open | |

| 2. Research Proposals pending (include information as in B.1., above). | | | |
|--|-------|---|------------------|
| Source | Role | Title | Total Amount |
| NSF | PI | Understanding and Using the Genetic Mechanism for Phytoremediation of Chlorinated Solvents – Environmental and Societal Impacts | \$379,497 |
| McIntyre-Stennis | PI | Understanding the Role of Select Endophytic Bacteria in Enhanced Growth and Disease Resistance | \$79,592 |
| NSF | PI | Impact of Exposure to Carbon Nanotubes on Heavy Metal Uptake by Plants | \$376,587 |
| USDA | PI | Impact of Nanoparticle Exposure on Uptake of Micro-Organisms by Plants | \$440,009 |
| BP | PI | Carbon Nanotubes for Enhancing Bio/Phytoremediation Of Crude Oil in Harsh Environments | \$105,000 |
| 3. Research Proposals submitted, but rejected (include information as in B.1, above) | | | |
| SUNY Health Now | PI | Isolation of Genetic Promoters to Increase Production of Plant-Based Biopharmaceuticals | Letter of Intent |
| SUNY 4E Network of Excellence | co-PI | Integration of Phytoremediation with Next-Generation Microbial Ecology | \$46,893 |
| ESF Seed Grant | PI | Isolation of Genetic Promoters to Increase Production Of Plant-Based Biopharmaceuticals | \$7,000 |
| Hill Collaboration Seed Grant | PI | Quantifying the Effects of Horticultural Therapy on Spinal Cord Injury Patients | \$14,724 |
| NASA Center for Advancement of Science in Space | co-PI | Bio-Identification of Ground Water Contaminants Using HICO Data | \$100,000 |

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

1. Weyens, N., B. Bram, K. Schellingen, R. Ceulemans, D. van der Lelie, **L. Newman**, S. Taghavi, R. Carleer and J. Vangronsveld. 2013. The potential of the Ni-resistant TCE-degrading 1 *Pseudomonas putida* W619-TCE to reduce phytotoxicity and improve phytoremediation efficiency of poplar cuttings on a Ni-TCE co-contamination. International Journal of Phytoremediation. Accepted. DOI:10.1080/15226514.2013.828016
2. Lin, W-C, G-p. Chang-Chien, C.M. Koa, **L. Newman**, T.Y.Wong, and J-K. Liu. 2014. Biodegradation of polychlorinated dibenzo-p-dioxins by *Pseudomonas mendocina* strain NSYSU. Journal of Environmental Quality. 43:349–357.
3. *Odom, L., J. Burken and L.A. Newman.* 2013 Distribution and accumulation of trichloroethylene and trichloroacetic acid in hybrid poplars. Journal of Environmental Engineering. 139:162-167.
4. Jones, K.W., R. Tappero, J. Wang, Y-c. Chen, Q. Yuan, W. B. Lindquist, L. Crandell, C. A. Peters, W. Um, L. Newman, T. Sabo-Attwood, and C. Moyer. 2013. Tomographic Investigations Relevant to the Rhizosphere. In: "Tomography and Imaging of Soil-Water-Root Processes. 2nd edition", S. H. Anderson and J. W. Hopmans (Editors), Soil Science Society of America. SSSA Sec Publ 61.
5. De La Torre-Roche, R., J. Hawthorne, Y. Deng, B. Xing, W. Cai, L.A. Newman, Q. Wang, X. Ma H. Hamdi and J.C. White. 2013. Multiwalled Carbon Nanotubes and C60 Fullerenes Differentially Impact the Accumulation of Weathered Pesticides in Four Agricultural Plants. Environmental Science and Technology. 4:12539-12547.

B. Non-refereed Publications

None at this time

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

(**BOLD indicates international venue; Italics indicated Keynote or Plenary talk**)

2014

- Bioremediation - Mini Plenary talk. Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.
- Medical Molecular Biology - Mini Plenary talk. Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.

2013

- *What does the Future Hold?* 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.

C.1. Invited talks

2013

The State University of New York College of Environmental Science and Forestry and the Mahidol University Working Together. **Mahidol University, Bangkok, Thailand.** 3 November 2013.

ESF Programs in Environmental Biology – Making Collaborations Work. **Mahidol University, Bangkok, Thailand.** 4 November 2013.

STUDENT AND COLLEAGUE PRESENTATIONS (* denotes oral presentations, student names italicized, bold indicates award won)

2014

- Gold Nanoparticles in the Environment: Studying the Genetic Toxicity and Bioavailability in Hydroponic Exposures and Soils with *Lycopersicon esculentum* (Tomato ‘Brandywine’). *B. Agtuca, J. McMullen, W. Cai, C. Murphy, J. White, T. Sabo-Attwood and L. Newman.* Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.
- Remediation of Trichloroethylene using Constructed Wetlands: A Study of the Biotic Interactions. *C. Warner, S. Hohm, A. Ludlow, D. Tsao and L.A. Newman.* Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014. **First Place Student Presentation Award.**
- The potential for herbicide safener Naphthalic Anhydride to reduce the symptoms of heavy metal toxicity in *Zea mays*. *F. Afelumo, S. Garrett and L. Newman.* Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.
- Trichloroethylene Degradation by Genetically Modified Tobacco (*Nicotiana tobaccum var. xanthi*). *J. McMullen, D. Speer, J. Tirot, and L. Newman.* Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.
- Trichloroethylene Plume Detection using Hyperspectral Imaging. *A. Hoffman, D. Lewis, A. Keith, J. McMullen, J. Quattrocchi, R. Hamilton and L. Newman.* Biotechnology Symposium: Opening the Biotechnology Toolbox, Syracuse, NY. 15-16 May 2014.
- Remediation of Trichloroethylene using Constructed Wetlands: A Study of the Biotic Interactions. *C. Warner, S. Hohm, A. Ludlow, D. Tsao and L.A. Newman.* ESF Spotlight on Research. 15-16 April 2014.
- The effect of silver nanoparticles introduced to Tobacco Hornworm (*Manduca sexta*) using tobacco (*Nicotiana xanthi*). *L. Will, J. Quattrocchi, J. McMullen and L. Newman.* ESF Spotlight on Research. 15-16 April 2014.
- Gold Nanoparticles in the Environment: Studying the Genetic Toxicity and Bioavailability in Hydroponic Exposures and Soils with *Lycopersicon esculentum* (Tomato ‘Brandywine’). *B. Agtuca, J. McMullen, W. Cai, C. Murphy, J. White, T. Sabo-Attwood and L. Newman.* ESF Spotlight on Research. 15-16 April 2014.
- Quantifying the Effects of Horticultural Therapy on Spinal Cord Injury Patients. *D. Collins, H. Holmes, B. Ross, L. Messano, S. Lebduska and L. Newman.* ESF Spotlight on Research. 15-16 April 2014.
- The potential for herbicide safener Naphthalic Anhydride to reduce the symptoms of heavy metal toxicity in *Zea mays*. *F. Afelumo, S. Garrett and L. Newman.* ESF Spotlight on Research. 15-16 April 2014.
- Properties and Microbial Community Analysis of Soil from the Tahawus Mine Site. *V. Maietta, C. Dukelow, M. Tubbs and L. Newman.* ESF Spotlight on Research. 15-16 April 2014.

- Trichloroethylene Degradation by Genetically Modified Tobacco (*Nicotiana tabacum* var. *xanthi*). J. McMullen, D. Speer, J. Tirot, and L. Newman. ESF Spotlight on Research. 15-16 April 2014.
- Trichloroethylene Plume Detection using Hyperspectral Imaging. A. Hoffman, D. Lewis, A. Keith, J. McMullen, J. Quattrocchi, R. Hamilton and L. Newman. ESF Spotlight on Research. 15-16 April 2014.
- Potential for Ornamental Plants for Food Processed Waste Water Treatment. J.T. Whitaker, S. Wolcott and L. Newman. ESF Spotlight on Research. 15-16 April 2014.
- GreenWall Treatment of High Strength Organic Wastewater: Why won't my plants grow? S. Wolcott, G. Lutchmun, T. Endreny and L. Newman. ESF Spotlight on Research. 15-16 April 2014.
- Toxicity of Gold Nanoparticles in Soils and Hydroponics with Tomatoes. B. Agtuca, J. McMullen, W. Cai, C. Murphy, J. White, T. Sabo-Attwood and L. Newman. Emerging Researchers National (ERN) Conference in STEM. Washington DC, VA. 20-22 February 2014. **First Place poster presentation in Nano Science and Physics.**

2013

- *Quantifying the Effects of Horticultural Therapy on Spinal Cord Injury Patients. D. Collins and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Nanoparticle Co-exposure Alters the Toxicity and Accumulation of Persistent Pesticides in Agricultural Crops. J. C. White, R. De La Torre-Roche, J. Hawthorne, W. Cai, L.A. Newman, C. Wang, X. Ma and B. Xing. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Trophic Transfer Potential of Cerium Oxide Nanoparticles Through a Terrestrial Food Chain. J.C. White, R. De La Torre-Roche, J. Hawthorne, C. Musante, L.A. Newman, X. Ma and B. Xing. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Herbicide safener treated maize overproducing anthocyanin show alleviated symptoms of nickel toxicity. F. Afelumo, S. Garrett and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Remediation of Trichloroethylene in a Wetland Microcosm: The Role of Plants and Microbes. C. Warner, A. Ludlow, D. Tsao and L. A. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Trichloroethylene Plume Detection using Hyperspectral Imaging. A. Hoffman, D. Lewis, A. Keith, J. McMullen, R. Hamilton, J. Quattrocchi and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Initial Genomic Survey of Poplar OP-367 and Brandywine tomato after inoculation with the plant endophyte *Enterobacter* sp. 638. L. Will, A. Hoffman, J. McMullen and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Bioavailability and Genetic Toxicity of Gold Nanoparticles in Soils and Hydroponic Exposures with *Lycopersicon esculentum* (Tomato 'Brandywine'). B. Agtuca, J. McMullen, W. Cai, C. Murphy, J. White, T. Sabo-Attwood and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Toxicity screening of inorganic nanoparticles to Agricultural Crops. W. Cai, J.C. White, R. De La Torre-Roche, J. Hawthorn, C. Wang, X. Ma, Y. Deng, B. Xing and L. A. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Mycorrhizal *Lycopersicon esculentum* exposure to silver nanoparticles. A. Noori and L.A. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Properties and Microbial Community Analysis of Soil from the Tahawus Mine Site. V. Maietta, C. Dukelow and L Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Trichloroethylene Degradation by Genetically Modified Tobacco (*Nicotiana tabacum* var. *xanthi*). J. McMullen, R. Hamilton, A. Hoffman, J. Tirot and L. Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.
- Potential for Ornamental Plants for Food Processed Waste Water Treatment. J. T. Whitaker, S. Wolcott and L Newman. 10th International Phytotechnology Conference, Syracuse, NY 1-4 October 2013.

- D. Public Service Presentations (lectures, seminars, etc. to and for the public; give group or occasion, date(s), and attendance)
None at this time.

V. PUBLIC SERVICE

- A. Funded Service (include consulting activities)
1. Government Agencies (Federal, State, Local):
None at this time
 2. Industrial and Commercial Groups, etc.
None at this time
- B. Unfunded Service to Governmental Agencies, Public Interest Groups, etc.
Judge for International Genius Olympiad, SUNY Oswego, 18 June 2013
Reviewer, Department of Defense, ERDEC awards

VI. PROFESSIONAL DEVELOPMENT

- A. Professional Honors and Awards (for teaching, research, outreach, etc.)
2013 International Phytotechnology Society, Distinguished Service Award
2014 Best Faculty Advisor Award
- B. 1. Activities in Professional Organizations (offices held, service as chairman, member, participant or consultant)
Association of Environmental Health Sciences – Scientific Advisory Board, organizer for Annual Conference in Amherst, MA
International Phytotechnology Society –Immediate Past President; Chair of Gordon Award Committee, Chair of Educational Award Committee, Member of Organizing Committee for Annual Conference in Crete, Greece, 2014; Chair, Organizing Committee for Annual Conference held in Syracuse, NY in October 2013
Chair of Organizing Committee for Biotechnology Research Symposium in May 2014
Chair of Organizing Committee for Biotechnology Research Symposium to be held in May 2015 at Brookhaven National Laboratory
2. Professional Society Membership
Association of Environmental Health Sciences
International Phytotechnology Society
Northeast Phytoremediation Society
American Society of Microbiology

3. Other Professional Activities

a. Editorial activity

| <u>Journal (s)</u> | <u>Responsibility</u> |
|--|---|
| International Journal of Phytoremediation | co-Editor-in-Chief |
| <u>Other (books, symposia, etc.)</u> | |
| Phytoremediation: Management of Environmental Contaminants | Editors: Abid A. Ansari, SS Gill, R Gill, Guy Lanza, and Lee Newman |

b. Reviewer

| <u>Journal(s)</u> | <u>No. of manuscripts</u> |
|---|---------------------------|
| Journal of Biotechnology | 1 |
| Chemosphere | 1 |
| Environmental Science and Technology | 1 |
| Ecological Engineering | 1 |
| Environmental Science and Technology | 2 |
| Plant Science | 1 |
| Environmental Modeling and Assessment | 1 |
| <u>Agency</u> | <u>No. of proposals</u> |
| ESF Research Committee Seed Grants | 6 |
| ESF Research Committee McIntyre Stennis | 5 |

c. Participation (workshops, symposia, etc.)

| <u>Name of workshop, etc.</u> | <u>Date</u> | <u>Place</u> |
|---|----------------|--------------|
| Bioremediation Symposium Session Chair | 15-16 May 2014 | Syracuse, NY |
| Medical Molecular Biology Session Chair | | |
| Both at the 2014 Biotech Symposium | | |

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

None at this time

D. Foreign Travel (Where, When, Purpose)

| | | |
|-------------------|--------------|---|
| Bangkok, Thailand | 2-6 Nov 2013 | To develop MOU with administration from Mahidol University for a joint diploma program with their Biotechnology program and a newly developed Environmental Biology Program |
| | 3-7 May 2014 | External examiner for Ph.D. student Jirawan Torit, previous Visiting student in my lab |

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

- Course and Curriculum Assessment Committee member.
- Core Team Member for the Academic Research Building.
- Fall and Spring Transfer Student Advising
- Participate in the updating of the Natural History and Interpretation major
- Point person for deionized water treatment system
- Member of Environmental Chemistry Faculty Search Committee
- Chair, Environmental Microbiologist Faculty Search Committee
- Spoke at EFB and BTC orientation seminars
- Pre-Med Advisor, Environmental Biology students
- Chun Wang Award Committee, member

B. College-level

- Member, Committee on Research
- Participated in developing new Environmental Health major
- Curriculum group participant of Environmental Science
- Mentor for Undergraduate Honors and CSTEP programs
- Spoke at Environmental Science Orientation seminar
- Lead in developing MD/PhD program with Upstate Medical University
- Advisor, 3 + 3 Doctor of Physical Therapy Program
- Lead in developing NIEHS grant program
- Curriculum group participant of Environmental Science Coupled Natural and Human Systems
- Member of Hill Collaboration Nervous System Group
- Member of Hill Collaboration Cancer Group
- Member of Hill Collaboration Wounded Warrior Group
- Chair, Biotechnology Research Symposium organizing committee
- Curriculum Coordinator, Environmental Science Health and the Environment option
- Curriculum Coordinator, Environmental Health Program

C. University-wide, including Research Foundation

- Member of the SUNY Catalyst Committee for Research
- COIL participant
- Development of SUNY/BNL Research and education collaborations

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:

I have continued to teach the three courses I am required to teach, Cell Biology, Senior Synthesis and Molecular Techniques. I continuously work to improve all three courses, but I have put the most effort into the Cell Biology course, and I feel that it is improving with each time that I teach the course. At the end of the last lecture, I was again astonished and honored to have the class stand up and give me a round of applause. This type of response and recognition by the students inspires me to work even harder to continue to improve and bring elements to the course to engage the students. For the Senior Synthesis course, for the first time I had students in Biotech take the course, based on comments that they had heard from other students who recommended the course to students wishing to improve their presentation skills. Last year, I did a field trip with the Molecular Techniques to Cornell University to see their Biotech Center, so that they could see, and talk with the technicians, who run the biotech analytical equipment that I teach them about in class lecture, but which ESF does not have on campus. The students really seemed to like the tour, and I plan to do it again this coming semester. I continue to teach the Phytoremediation course (EFB496/796), which again had an increase in students over last year. I will discuss this more in the service to the Department and College. I taught the EFB496/796 Cell Biology Recitation again this year. As all of my students had taken the course, the numbers were lower, but the students who did take the course said that they greatly enjoyed the course and they learned valuable skills in both reading and understanding research articles, as well as presentation skills. I also taught the EFB496/796 Plant Physiology Recitation this year. I plan to continue to teach this course, but have it focus on different areas of plant physiology every year so that students can take the course more than once and continue to learn new material with each time the course runs. This coming year, the course will focus on plant microbe interactions. I also continue to co-teach Biodiversity II, with the topic area of Prokaryotes. It is a fun lecture series, and the students seem to enjoy it and ask a lot of good questions. This year I have had 28 students in the lab, PhD, MS and undergraduate. Two of my MS students switched to the PhD program. Three students were visiting PhD students, one from Iran, one from Thailand, and one from SUNY Buffalo. All fit into the lab very well, and were extremely productive. The student from Iran has stayed on, and is now a Post-Doctoral Fellow in the lab. In addition to these two international students, there are four other international students in the lab, two from China, one from Nigeria and one from Brazil, as well as a visiting scholar from China. The lab also hosts students from a variety of ethnic backgrounds, including Trinidad, Philippines, China, and Native America. The lab hosts not only a diversity of nationalities, but also religious and political backgrounds. Several students are or were in the Honors program, and several others are in CSTEP. The best thing about this is how proud the students themselves are of being in this diverse group. The students are extremely hard working, and this is reflected in the number of awards they have won locally and at internationally attended conferences. Then graduate student Azam Noori was part of a group of ten students I took to the International Phytotechnology Society Conference in October 2013, where she won third place for her oral presentation, and graduate student Camille Warner won first prize for her poster presentation at the Biotechnology Research Symposium in May 2014. I have continued to assist students to have quality internships, with Beverly Agtuca continuing her internship at Brookhaven National Lab. Several had internships with a colleague who is manager of the largest greenroof company in the US. I continue to work with the students to develop their sense of community by hosting laboratory trips to places that are both fun and educational (Corning Museum of Glass and the Rosamond Gifford Zoo). I also work with the students to develop the importance of community service by participating in a food drive – last year the lab purchased and delivered over \$1600 of food to a local food pantry. Undergraduate student Beverly Agtuca was also a SUNY Chancellor's Award student this year for her research and service work.

Department/College/SUNY

I am continuing my work on the departmental Course and Curriculum Assessment Committee, the college Committee on Research, and the SUNY Catalyst Committee. I also continue to participate in three Hill Collaboration groups, Neuroscience, Cancer, and Wounded Warrior. As part of this last group, we are working for the second year with a former ESF graduate, Dr. Stephen Lebduska, who currently serves as the head of the Spinal Cord Injury Unit at the Syracuse Veterans Hospital on a Horticultural Therapy program for inpatients in the unit. We are working not only with the hospital, but also with other community groups to obtain the plants and supplies for the program, and we currently have two current students and two former students working at the VA on this program. The program involves growing plants on a rooftop garden, in room plants for patients, maintaining plants in common areas, and devising enrichment programs involving gardens and plants for the patients during the winter months. We are also working with Clear Path for Vets to develop a garden for their Culinary Command program. I chaired the departmental search committee for the new faculty hire in environmental microbiology, and served on the search committee for the new hire in Chemistry for a faculty member to be part of the Environmental Health Program. For the third year, I was chair of the organizing committee for the Biotechnology Research Symposium, which continues to attract both academic and industry representatives. In 2013, I invited as a plenary speaker Dr. Henry Daniels, who is recognized by the Bill and Melinda Gates Foundation and Nature Biotechnology as the leading scholar worldwide on the production of plant based pharmaceuticals. He has since come to ESF and gave a seminar at the school in the Plant Physiology Recitation course, and we then spent time working to develop a collaborative research program, and to discuss ESF Biotechnology students to intern in his lab. This visit result in proposals sent to the SUNY Health Now program, and the ESF Seed grant program. During the past year in the EFB496/796 Phytoremediation course, I had three speakers give seminars that were open to the college and the public, the first being Ms Kate Kennen, who is principal in a Landscape Architect firm outside Boston, and she visited with Tim Tolland and Doug Johnson while she was here. The two other speakers were Dr. Chris Barton from University of Kentucky and Dr. Barbara Zeeb from the Royal Military College in Kingston, Ontario. I am currently working with the administration at Brookhaven National Laboratory and Garrett Sanders and Tim Killen of the Research Foundation to forward the major goals of the MOU, which was to increase research collaborations between SUNY and BNL. I also organized a tour of the BNL facility for Drs. Donald Leopold and Russell Briggs. I have been working with Drs. Bongarten and Shannon to develop a joint diploma program with Mahidol University in Bangkok, Thailand for both the Environmental Biology and the Biotechnology majors. This program would allow students from Mahidol University to do their last academic year here at ESF, and then receive diplomas from both ESF and MU. As the program develops, ESF students would also be able to go to MU for a semester or academic year to participate in an international learning program. In this vein, I am also working with the SUNY COIL program to develop a jointly-taught course with the University of Parma, where students at both universities would take a phytoremediation course, and run joint literature review projects between the two universities. I have also become more involved in the ESF health related programs. I have continued working with both ESF and UMU administration to develop and implement a joint MD/PhD program, and this is moving forward. I am working with Dr. Gord Patterson to develop a graduate program in Environmental Health, and I am the Pre Health Advisor for students in the Environmental Biology Major. I am also the ESF advisor for students wishing to participate in the UMU 3+3 program to earn a Doctor of Physical Therapy degree. I am also the Coordinator for the Health and the Environment option in Environmental Science, and was appointed the Curriculum Coordinator for the new major in Environmental Health, where I am not only doing curriculum coordination, but also updating the web site and promotional materials for students, administrators and fund raising, and also working with Dr. Bongarten on developing descriptions for new faculty hires for the program as well as recruiting new ESF faculty to participate in the program.

Self:

I continue as Co-Editor in Chief for the International Phytoremediation Journal, which has continued to increase the number of submissions received every year. The publishers continue to increase the number of issues, and from a quarterly journal we are now moving to 12 issues a year, will fill 8.5 x 11 pages. Our impact factor continues to be strong for a specialized journal, even considering the increasing number of articles published every year. I continued to serve as the Immediate Past President of the International Phytotechnology Society after serving 6 years as President. The Society continues to grow and the conferences remain strong every year. I was also the chair of the organizing committee for last year's conference, which was held in Syracuse in October 2013. The conference hosted over 220 attendees from 24 countries. I also continue my role on the Scientific Advisory Board for the Association for Environmental Health Sciences. This past year, with travel to Thailand, I have continued to increase international contacts, with the aim of developing more international collaborations. I also am developing collaborations with colleagues in the Czech Republic and Italy, and I have been asked to go to Kazakhstan to teach course of biotechnology. I am also working to developing more collaborative ties within the SUNY system, and I am starting to work with new colleagues from SUNY Binghamton (Chemistry Dept) and Buffalo (Engineering) to develop joint research programs. Last year, I submitted a grant (co-PI) with the group from SUNY Buffalo through the 4E program. While it was not funded, we did get good reviews and plan to resubmit. While my publications remain excellent in quality and are published in top journals in my field, I look forward to increasing the number as more graduate students move through the lab. And finally, I continue to work with an international team of editors to work on the book Phytoremediation: Management of Environmental Contaminants. In 2014, NASA was awarded a patent on the work we have been doing for them for the past 7 years, with two other colleagues and myself listed as the inventors on the patent. In 2014, I was approached by a science reporter to be interviewed on the Public Radio International program The World, as an expert on phytoremediation and to discuss the use of phytoremediation on the Fukushima Nuclear Reactor radioactive waste problem. Two months later, North East Public Radio program Academic Minute did a second interview with me on the same topic. And finally, in the past year I received two awards; the first a Distinguished Service Award from the International Phytotechnology Society for organizing the annual meeting. The second was the Best Faculty Advisor Award from the ESF Undergraduate Student Association.

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)

In addition to what is detailed below:

I want to submit more research grants to move more of my students off of teaching assistantships and onto research assistantships. While the TA is definitely beneficial to the student training and the department, allowing students to focus more on their research will ultimately benefit all.

I want to develop both the 496/796 Phytoremediation course and the EFB 496/796 Cell Biology Recitation into fully listed courses, and I want to introduce a Phytotechnology course similar to one I previously taught to be given on alternate years. This new course would outline all the different ways that plants are used by society, and not just focus on the remediation aspects. I want to develop the BTC499 Senior Synthesis course into a two credit course, to have the time to work more with students to develop their presentation and writing skills.

Additionally, I want to find the time to develop a Phytoremediation/Phytotechnology program at ESF, as the College has everything it needs course-wise to do this – it just requires the organization to make it a reality.

I want to see Plant Physiology actually taught at ESF!

I want to continue to develop the Horticultural therapy program, as this is generating a lot of interest at the VA and in the community, and ESF, the Veterans and the students can benefit from this program.

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2014

- a. Course(s) to be offered
None at this time.
- b. Proposed research activity
Write more grant proposals!

Write more papers!

Research activities include the continuation of research projects already underway by graduate and undergraduate students in the laboratory. These include the verification and development of a hyperspectral imaging system to determine exposure of plants to the groundwater contaminant trichloroethylene. Previous work has shown that this will be possible, but we now need to refine and confirm the initial findings. We are expanding our scope of studies to look at native and naturalized plants that would be found on impacted sites, and compare that to our poplar data. We are also working to understand the nature of the signal at a molecular level by developing a 2-D gel electrophoresis system for this analysis. This work is being done by a graduate student and an undergraduate student. We are also expanding this program to work with EPA to develop the sensor to detect heavy metal contamination, and also working with the International Space Station team to develop a system that can monitor plant health for long-term space missions, such as to Mars.

Although TCE phytoremediation is well understood in terrestrial systems, the mechanism of action of TCE remediation in wetlands is still a 'black box.' With support from Roux Associates, and in collaboration with colleagues from Cold Regions Research and Engineering Laboratory and BP Corporation, we are doing research to understand the complimentary roles

of abiotic soil processes, soil microbes and plants in TCE wetland remediation. This work is being done by a graduate student supported during the summer by Roux Associates.

We are also looking at plants in vertical systems, where we are studying how treatment walls can be used to treat waste water from brewery operations. We are looking at the efficiency of removal, the role of the plants and biofilm, and also trying to determine if this treatment can be coupled with a production system to not only be an aesthetically pleasing remediation system, but also potentially produce herbs and microgreens for service in associated restaurants. This work is being done by a graduate and an undergraduate student at ESF, and several undergraduate students at RIT.

We are also continuing research into the beneficial effects of plant endophyte interactions. This includes working with a colleague, George Newcomb, at the University of Idaho into the ability of select endophytes to confer resistance to various fungal pathogens. This project will be funded through a McIntyre Stennis award, and a graduate student will be added to this project. We are also looking at how, on a genetic level, the endophytes increase growth and productivity in crop plants and biofuel plants. This work is being done by a graduate student. We are also interested in how the endophytes might enhance groundwater remediation and a new graduate student is developing this project.

We are also continuing to look at genes that we believe are involved in the degradation pathways for chlorinated solvents, including TCE. We currently have several genetically engineering lines in the laboratory where Arabidopsis genes encoding several different P450 Enzymes have been placed under the control of a strong constitutive promoter and inserted into *Nicotiana xanthi* lines. These will be studied to correlate changes in TCE metabolism with gene expression levels. This work is currently being done by a graduate student who will be assisted by a visiting PhD student from Thailand who is due to arrive this summer. We submitted an NSF grant in February for this project.

We are continuing to look at the impact of safeners, supposedly inert compounds in pesticide formulations, on toxicity resistance and metal uptake in plants. We are looking at how the safeners up regulate gene expression for stress response elements, and how this might decrease toxicity to heavy metals in plants, and thus allow for increased metal accumulation before plant senescence. This work is currently being done by a graduate and an undergraduate student.

We are looking at how to understand the systems and processes that will result in the most efficient restoration work being done at a mining site in the Adirondacks. With Paul Hai from the AEC, we have collected soils from the mine site, and are doing both physical and microbiological analysis of the soils to determine those characteristics seen at sites with restoration success. This work has been done in the past by three undergraduate students, two of whom graduated. We plan to recruit more students to this project.

We are also continuing our studies on plant nanoparticle interactions. This work is being done by several graduate and undergraduate students in the laboratory. These studies include, but are not limited to:

The changes in gene expression following nanoparticle exposure

Transporters

Toxicity response

Metabolic response

The impact of decreasing concentrations on gene expression variations

The time course of gene expression changes

The impact of different soil types on bioavailability

How size and shape impact uptake and translocation

How different type nanoparticles (copper, zinc, platinum, gold, etc.) impact crop plants

The metabolic changes in plants following nanoparticle exposure

With Dr. Cathy Murphy of University of Illinois, the impact of soil exposure on nanoparticle chemistry

With Dr. Ryan Tappero at Brookhaven National Laboratory, the three-dimensional tomographic imaging of plants at the synchrotron light source

Understanding how mycorrhizal organisms will impact both uptake and accumulation of nanomaterials in the soil. This work is being done by the post doc who was originally a visiting PhD student from Iran.

Understanding the accumulation patterns for nanomaterials in insects following ingestion of nanomaterials exposed plants.

With Dr. Vishal Shah at Dowling College, the impact on nanoparticles on commensalistic skin microbes. As many consumer products now contain nanoparticles, understanding the role these exposures have on beneficial microorganism health is critical.

With the visiting scholar from China, how possible transport of nanoparticles from foliar applicants to non-exposed plant tissues

USDA grant application: the impact of nanoparticle exposure on uptake of potentially pathogenic organism

BP grant application: the impact of nanoparticle exposure on the uptake and degradation of petroleum compounds

With Medical personnel (doctors and therapists) from the Veterans Affairs hospital, we are developing a horticultural therapy program to benefit patients in the spinal trauma unit. This will include outdoor sensory gardens to increase physical mobility, and plants that stimulate all five senses to help draw out patients also suffering from stroke or Traumatic Brain Injury. Also in the program will be indoor recreational and therapeutic activities to increase patient interactions through the use of plants. We are also working and will continue to work with Clear Path for Vets to develop these programs for a wider audience.

We will also continue to get preliminary data to resubmit grant proposals to develop a program in phytopharmaceutical production using nuclear encoded plastid transporters.

c. University, professional society, and public service

Continue with services as described:

Membership and Service to the International Phytotechnology Society

Planning the 11th International Phytotechnology Society meeting on 30 September to 3 October at Heraklion, Crete, Greece

Co-Editor in Chief for the International Journal of Phytoremediation

Continue to all current committee work

Continuing to work with Drs. Greg Boyer and John Hasset on exploring the potential for ESF to apply to the National Institute of Health to host a Superfund Research Center.

Continue to attend and participate in the open houses and receptions for new incoming freshman and transfer students

Serve as Chair of the Organizing Committee for the 2015 Biotech Conference to be held at Brookhaven National Lab

Additionally, I will continue to do the following:

Working to develop a concentration in Phytotechnologies at ESF, with both undergraduate and graduate programs

Work with colleagues at ESF and UME to develop a collaborative MD/PhD program
 Serve as the ESF 3+3 Coordinator for the Doctorate in Physical Therapy Program
 Work with Colleagues at ESF to develop the MS and PhD degrees in Environmental Health
 Work with colleagues at ESF, UMU, SU and the VA to develop a concentration in Horticultural Therapy, with a certificate and research program
 Continuing work with Drs. Guy Lanza (EFB Adjunct) and Dr. Prayad Pokethitiyook (Biology Department Chair, Mahidol University, Bangkok, Thailand) to develop collaborative research programs between ESF and Mahidol University.
 Become more active with local groups, including Syracuse Grows, the LIPA Park Committee, and the local branch of the Sierra Club
 Make more contacts with local environmental firms, as well as the central New York regulators, both federal and state to learn more about the regional environmental issues
 Continue to work to develop programs with Roux Associates, Xeroflora International, Alcoa Corporation and the Corps of Engineering CRREL Laboratory that will enhance research and internship opportunities for ESF faculty and students
 Continue to work with faculty and administrators at ESF and other SUNY campuses, the Research Foundation and Brookhaven National Laboratory to develop research and training opportunities that benefit both SUNY and BNL.
 Continue as Coordinator for both the Health and the Environment Option and the Environmental Health major.
 Continue to serve as the Pre Health Advisor for Environmental Biology
 Develop the international course with faculty at the University of Parma
 Serve on the Chemistry search committee for the new faculty member for the Environmental Health Major, and work with Dr. Bongarten to develop search programs for two new faculty hires for the major.
 Develop promotional materials for the Environmental Health Major, for students, administrators and potential donors
 Work with Dr. Murphy to purchase equipment funded through the 2020 grant that ESF received to start the development of a Environmental Health Biotechnology Center.

2. Fall Semester 2014

a. Course(s) to be offered

BTC401/EFB601 Molecular Biology Techniques
 BTC420 Internship in Biotechnology
 BTC/EFB298 Research Apprenticeship
 BTC/EFB498 Undergraduate Research
 EFB495 Undergrad Exp/ College Teaching
 EFB496/796 Plant Physiology Recitation
 EFB899 Masters Thesis Research
 EFB999 Doctoral Thesis Research
 ENS132 Orientation Seminar in Environmental Science

b. Proposed research activity

See above

c. University, Professional society, and public service

See above

3. Spring Semester 2015

a. Course(s) to be offered

EFB325 Cell Biology
EFB496/796 Cell Biology Recitation
EFBxxx Phytoremediation
BTC499 Senior Synthesis
EFB202 Diversity of Life (co-teach)
BTC420 Internship in Biotechnology
BTC/EFB298 Research Apprenticeship
BTC/EFB498 Undergraduate Research
EFB495 Undergrad Exp/ College Teaching
EFB899 Masters Thesis Research
EFB999 Doctoral Thesis Research

b. Proposed research activity

See above

c. University, professional society, and public service

See above