



National Science Foundation Center Education and Outreach
Questionnaire
Requested by U.S. House of Representatives' Committee on
Science and Technology

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**NSF Center
Education & Outreach Questionnaire**

**Response from the National Institute for Mathematical and Biological Synthesis
(NIMBioS) at the University of Tennessee, Knoxville, funded through Cooperative
Agreement EF-0832858, Louis J. Gross, Director and Principal Investigator**

June 24, 2009

1. What specific educational activities, both formal and informal, has your center undertaken?¹

Formal educational activities include:

NIMBioS REU/REV: NIMBioS sponsors a summer research experience program for undergraduates and veterinary students. These students live on campus and work on teams with UT professors on innovative math/science projects. Two high school teachers are also participating this year.

NIMBioS is cooperating with SCALE-IT and PEER graduate fellowship programs, at the University of Tennessee, funded by NSF and NIH respectively. Graduate assistantships are also available for four UTK students per year.

R Seminar: An R seminar was co-sponsored by NIMBioS and the University of Tennessee's Ecology and Evolutionary Biology Department to help students learn how to use the statistical package R. This has resulted in a guide to R for Biologists that is openly available from NIMBioS.

High-Performance Computing Tutorial: This tutorial focused on presenting the tools necessary for organizations and individuals to leverage computational resources for research at the interface of biological/computational/mathematical research.

GSMNP: NIMBioS is working with the Great Smoky Mountains National Park to promote math and science. NIMBioS sponsored two teachers for the Tremont Science Teacher Workshop and NIMBioS staff presented information about our institute and lead a session on data analysis. NIMBioS staff also worked with rising 8th grade girls in the Girls in Science Program at Tremont.

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For a definition of informal education and representative activities please view the following report (esp. page 25): US Department of Education. *Report of the Academic Competitiveness Council*. May 2007. <http://www.ed.gov/about/inits/ed/competitiveness/acc-mathscience/report.pdf>

PUMP: NIMBioS participated in a panel on undergraduate mathematical biology programs called PUMP organized by MBI, SIAM, and SMB at MBI. We are helping to produce a report that will serve as a resource for individuals and institutions developing initiatives in quantitative biology for undergraduate students.

NIMBioS is part of the Vision and Change in Undergraduate Biology Education Committee sponsored by AAAS with NSF funding. NIMBioS held a student mini-conversation for AAAS to determine which issues students find most pressing and how to best use student input for the Vision and Change Steering Committee for Educational Reform reports. Two students were nominated to attend the Vision and Change conference in Washington, D.C. from the mini-conversation. The NIMBioS PI is on the Steering Committee for this Conference.

Biology in a Box: NIMBioS is partnering with Biology in a Box at the University of Tennessee to add math exercises to these biological thematic units. Biology in a Box is a fun and challenging way for entire schools to enhance their life sciences curriculum at all grade levels and to encourage student interest in STEM (science, technology, engineering, and mathematics) disciplines. The program employs a hands-on, inquiry-based approach to teach the wonders of the living world, as well as introducing the scientific methods and math skills we use to understand that world.

Undergraduate Conference in Mathematical Biology: NIMBioS will host a conference for undergraduates in biology and mathematics in October 2009. The conference includes student talks and posters and a guest plenary speaker. The conference features a panel to take questions about research and careers in math biology. Additionally, a NSF UBM PI meeting will take place at the conference.

Education and Outreach Biology Center Meeting

NIMBioS initiated communication between NEScent, NEON, NCEAS, iPlant and AIBS to talk about possible avenues of collaboration between the institutions and centers. An education and outreach meeting is planned at NEScent for a more in depth discussion.

Kids U at UT: NIMBioS taught a Kids U course, "Biology by Numbers!" at the University of Tennessee, Knoxville, this summer for students in grades 4-6 to learn about biology using mathematics.

Teacher Collaboration Program: The Teacher Collaboration Program provides links between teachers, scientists, and educators with interest in mathematical biology. NIMBioS will pair teachers with interest in mathematics and biology with active researchers in the math biology community.

Undergraduate Biology Curriculum Workshop: NIMBioS, SCALE-IT, and BioQuest are co-sponsoring an Undergraduate Biology Curriculum Workshop called Integrating Bioinformatics and Molecular Visualization into the Undergraduate Biology Curriculum for faculty on bioinformatics and visualization, which are rapidly developing research

approaches throughout the biological, physical, and mathematical sciences curriculum. The emphasis will be on creating teaching units that apply biological problem solving strategies to real problems in medicine, epidemiology, forensics, agriculture, and conservation.

Informal activities to date include:

NIMBioS held booths with interactive exercises and information about math biology for Earthfest in Knoxville, TN 2009 and Earth Day in Oak Ridge, TN 2009.

2. What specific outreach activities has your center undertaken?

Mu Alpha Theta: NIMBioS is currently helping organize the Mu Alpha Theta High School Math Honorary Society annual convention to be held in Knoxville, TN, in July 2009.

Joint Math Meetings: At the Joint Mathematics Meetings held in Washington, D.C., January 2009, NIMBioS together with the Mathematics Institutes in the US and Canada sponsored a reception with presentations on opportunities available through these institutes.

Computational Biology Seminar Series: These seminars were co-sponsored by the Scalable Computing and Leading Edge Innovative Technologies (SCALE-IT) graduate fellowship program, NIMBioS, UT's Department of Biochemistry, Cellular, & Molecular Biology, and UT's Graduate School of Genome Science and Technology. Researchers in computational biology presented a total of 11 seminars during the spring term 2009.

NIMBioS Multidisciplinary Seminars (Job Candidate Presentations)

There were a total of 14 job candidate presentations for faculty positions associated with the NIMBioS search, with attendance of 30-50 people at each seminar. Seminars were co-hosted by various departments at the University of Tennessee including Biochemistry, Cellular and Microbiology, College of Veterinary Medicine, Ecology and Evolutionary Biology, Electrical Engineering and Computer Science, Forestry, Wildlife, and Fisheries, Mathematics, Microbiology, and Physics,

NUMB3R5 Count Workshop: This workshop was for faculty interested in addressing the gap between mathematics and its application in biological problem solving. To support the observation, experimentation and modeling of data, the Numb3r5 Count workshop provided an introduction to data, tools, and curricular materials for use with undergraduates. Cosponsored by NIMBioS, BioQuest and HHMI.

Presentations formal and informal included:

- Formal talk to University of Tennessee, Math Dept faculty, 28 Aug 2008, S. Lenhart

- Discussion with colleagues at the VI International Conference on Ticks and Tick-borne Pathogens, Buenos Aires, Argentina, 24 Sep 2008, G.Hickling
- Formal talk to Oak Ridge National Laboratory, Biology and Environmental Sciences Division, 2 Oct 2008, L. Gross, G. Hickling
- Formal talk on NIMBioS at AIBS Board of Directors Meeting, 13 Oct 2008, L. Gross
- Formal presentations on NIMBioS to Agencies in DC area (NIH, NSF, OSTP and USDA), 14 Oct 2008, L. Gross
- Informal presentation to high school teachers at UT Math Contest, 14 Oct 2008, S. Lenhart
- Informal presentation to Biomedical Science and Technology Center at Oak Ridge National Laboratory, 16 Oct 2008, S. Lenhart
- Formal talk to Univ. Tennessee Deans Council, 17 Oct 2008, L. Gross
- Formal talk to Univ. Tennessee Arts and Sciences Department Heads, Oct 2008, L. Gross
- Formal talk on NIMBioS at Natural Areas National Meeting, 17 Oct 2008, L. Gross
- Informal talk at the 11th International Conference on Lyme Borreliosis and Other Tick-borne Diseases, Irvine CA., 20 Oct 2008, G. Hickling
- Formal talk on NIMBioS to UT Board of Trustees, 23 Oct 2008, L. Gross
- Formal talk on NIMBioS at NSF UT IGERT Programs kick-off, 23 Oct 2008, L. Gross
- Informal presentation at AMS sectional meeting at the University of Alabama at Huntsville, 26 Oct 2008, S. Lenhart
- Informal talk with the Wildlife Diseases Working Group, The Wildlife Society 15th Annual Conference, Miami FL., 10 Nov 2008, G. Hickling
- Formal talk on NIMBioS at California State University at San Marcos (CSUSM), MARC II, 13 Nov 2008, L. Gross
- Formal Talk on NIMBioS to faculty from CSUSM and Palomar and MiraCosta Community Colleges, 13 Nov 2008, L. Gross
- Formal talk to CSUSM undergraduates including discussion of NIMBioS, 13 Nov 2008, L. Gross
- Formal talk at TIMBER Conference at Appalachian State University , 15 Nov 2008, S. Lenhart
- Informal discussions at Biology Summit (NAS) - AAAS - Washington DC, 3-4 Dec 2008, L. Gross
- Informal discussions with NRC Board on Life Sciences - Washington DC, 4-5 Dec 2008, L. Gross
- Formal talk at NIH-MIDAS Network meeting, Monterrey CA, 5 Dec 2008, S. Lenhart
- Presentation: Adaptive radiation: contrasting recent theory and data. U. of Paris, Orsay-Sud, France. Included discussion of NIMBioS with researchers & students in ecology & evolution, 8 Dec 2008, S. Gavilets
- Presentation: Dynamics of coalition formation and the egalitarian revolution. U. of Strasburg, France. Included discussion of NIMBioS with researchers & students in biology, 9 Dec 2008, S. Gavilets

- Formal talk at Math Institutes Reception of the Joint Math Meetings, Washington DC, 5 Jan 2009, S. Lenhart
- Informal presentation at BIO-SIGMA business meeting (math-biology special interest group of MAA), Joint Math Meetings, Washington DC, 6 Jan 2009, S. Lenhart
- Informal discussions at iPlant Collaborative Workshop on Cyberinfrastructure for Plant Science - Arizona, 8 Jan 2009, L. Gross
- Formal talk at Belmont University - Nashville, 20 Jan 2009, L. Gross
- Informal discussion of NIMBioS opportunities with participants at the Regional Conference to Assess Research and Extension Needs in
- Integrated Pest Management to Reduce the Incidence of Tick-Borne Diseases in the Southern United States. CDC Atlanta., 20-21 Jan 2009, G.Hickling
- Presentations and discussions introducing NIMBioS and exploring partnership with North Carolina A&T University, 26-27 Jan 2009, S.Duncan, S. Lenhart, C. Peterson
- Talk to East Tennessee Public Health Forum on NIMBioS and implications for epidemiology and public health, 5 Feb 2009, L. Gross
- Meeting with GSMNP Education Staff, 10 Feb 2009, S. Duncan, G. Hickling, S. Lenhart
- AAAS Meetings: discuss mini symposium on Biological questions addressed by multiscale mathematical methods; attend symposium on Math in entry-level biology - Chicago, 12-15 Feb 2009, L. Gross
- Presentation: NIMBioS informational talk at Tennessee Governor's Academy, Knoxville (honors high school), 19 Feb 2009, S. Lenhart
- Presentation: NIMBioS informational talk at Virginia Tech, Blacksburg, 20 Feb 2009, S. Lenhart
- HHMI program advising: link Math and Biology for undergrads - Wilkes College, Wilkes Barre, PA, 22-24 Feb 2009, L. Gross
- Presentation: Dynamics of ecological speciation: case studies and mathematical models' U. of Fribourg, Switzerland. Included discussion of
- NIMBioS with researchers & students in ecology & evolution, 24 Feb 2009, Sergey Gavrilets
- Presentation: New Opportunities for Graduate Education at UTK. At retreat for BCMB and GST programs coupled with recruiting of new graduate students. 6 Mar 2009, C. Peterson
- Presentation: NIMBioS informational talk at MAA Southeastern Section Meeting, Belmont Univ., Nashville, TN, 14 Mar 2009, S. Lenhart
- Poster presentation on NIMBioS at Biomedical Science and Engineering Conference at Oak Ridge National Laboratory, 18 Mar 2009, S.Lenhart
- Presentation to the 2009 Great Smoky Mountains National Park - Science Colloquium, Gatlinburg. Introducing NIMBioS, The National Institute for Mathematical and Biological Synthesis, in partnership with Great Smoky Mountains National Park. 20 Mar 2009, G. Hicklin, S.Lenhart
- Discussion with chair of Biology Department at Florida Institute of Technology, Melbourne, FL, 16 Apr 2009, S. Lenhart

- NIMBioS informational welcome to Coalitions and Alliances working group, 16 Apr 2009, L. Gross
- University of Tennessee, Knoxville - Undergraduate Mathematics Day - 'What's math got to do with it? Drugs, sex and rock and roll -connections between math and biology at NIMBioS', 18 Apr 2009, L. Gross
- NIMBioS informational welcome to Intragenomic Conflict working group, 20 Apr 2009, C. Welsh
- NIMBioS informational welcome to Feral Swine/Pseudorabies working group, 26 Apr 2009, C. Welsh
- La Selva Biological Field Station, Costa Rica- 'Ecological complexity and Public Policy', 'Quantitative Approaching to Assessing Patterns of Change in Forests', 27-28 Apr 2009, L. Gross
- Washington University, St. Louis - 'Space and Control in Natural Systems', 'Mathematics and Life Science Education: Promoting Interdisciplinarity', 4 May 2009, L. Gross
- University of Texas, El Paso, TX -'Mathematics and Life Science Education: Promoting Interdisciplinarity', 11 May 2009, L. Gross
- Pelissippi State Technical Community College, Knoxville, TN-NIMBioS informational presentation and *Biology in a Box* program session for community college professors who are teaching future K-12 teachers, 12 May 2009, S. Duncan
- Vanderbilt Shanks Conference, 18 May 2009, Steve Wise
- Presentation to Workshop for Emergency Response to Disease at the Wildlife/Livestock Interface, Georgia Center for Continuing Education, University of Georgia, 12-14 May 2009, G. Hickling
- NIMBioS informational welcome to Binary Matrices in Biology working group, 26 May 2009, L. Gross
- NIMBioS informational welcome to NUMB3R5 Count workshop, 29 May 2009, L. Gross
- Washington State University, Pullman, WA - Pacific Northwest Conference on Comprehensive Mathematical Modeling in the Natural and Engineering Sciences Organized in the Spirit of L. A. Segel - 'Space and control in Natural Systems', 3 Jun 2009, L. Gross
- Formal talk at the Chinese Society for Math Biology and Society for Math Biology Joint Meeting - China, 15-17 Jun 2009, L. Gross
- NIMBioS informational presentation to the Science Teachers Workshop at the Great Smoky Mountains National Park Tremont Institute, 17 June 2009, S. Lenhart
- Informal presentation on data analysis to the Science Teachers Workshop at the Great Smoky Mountains National Park Tremont Institute, 17 June 2009, S. Duncan
- NIMBioS informational welcome to the Molecular Visualization Workshop, 22 June 2009, S. Lenhart
- NIMBioS informational presentation to the Girls in Science participants at the Great Smoky Mountains National Park Tremont Institute, 23 June 2009, S. Lenhart

- Informal presentation on data analysis to the Girls in Science participants at the Great Smoky Mountains National Park Tremont Institute, 23 June 2009, S. Duncan

3. Who is the target audience for education and outreach activities?

Outreach and Education are a significant component of NIMBioS activities. These activities cover a broad audience including K-12 students and teachers, undergraduates, graduate students, postdocs, faculty, and the general science population (seminars, presentations).

4. What percentage, by effort and/or by budget outlay, of center resources are dedicated toward education and/or outreach?

NIMBioS is by design interdisciplinary, which implies that much of our research-focused activities include components that educate biologists about mathematics and mathematicians about biology. Separating these educational aspects of the NIMBioS research mission based on budget or effort is far from exact. A rough estimate is that 30% of the research-focused activities of NIMBioS (including Working Groups, Workshops, Post-doctoral Fellows, Sabbatical Fellows and the Visitor Programs) could be viewed as educational. When these are combined with the budgets for undergraduate research, outreach coordination, and appropriate percentage allocation of faculty and staff effort, approximately 36% of the total NSF-supported budget for NIMBioS is for education and outreach activities.

5. Does the center have a dedicated education or outreach staff member(s)? If so, what are their pertinent qualifications? Yes, three people are strongly involved in education and outreach at NIMBioS.

- Dr. Suzanne Lenhart, Associate Director of Education, Outreach and Diversity for NIMBioS, Department of Mathematics at the University of Tennessee. (25% time appointment at NIMBioS).
- Sarah Duncan, full-time Education and Outreach Coordinator for NIMBioS, Masters degree in biology and with 5+ years experience in science education outreach and activities.
- Dr. Cynthia Peterson, Associate Director for Graduate Education for NIMBioS, Head of the Department of Biochemistry and Cellular and Molecular Biology. (12% appointment at NIMBioS)

Additionally, the NIMBioS Communications Coordinator, Dr. Catherine Crawley, devotes a majority of her effort to broad communication about the activities of NIMBioS to the scientific community and general audiences. This involves a variety of informational items posted on the NIMBioS.org web site, Facebook and Twitter communications, and a variety of newsletter and email distributions. Dr. Crawley has a Ph.D. in Science Communication and five years of experience teaching communication and working on scientific journalism projects.

6. Please describe how your education and outreach activities were initially developed. What educational resources were used in designing these activities? Were any resources provided by the university? Were any resources found through NSF or other federal agencies? Did you communicate or collaborate with existing NSF centers?

The plans for outreach and education were based to considerable extent upon prior efforts of the PI in these areas, including his long-term focus on quantitative education in the life sciences at many different educational levels, his service on various advisory boards and task forces related to education (for example, he was chair of the National Research Council Committee on Integrating Education in Biocomplexity Research, as well as a participant in the National Research Council report Bio2010: Transforming Undergraduate Education for Future Research Biologists), and his service as President of the Society for Mathematical Biology and long-term involvement in the SMB Education Committee. The educational resources considered included results from numerous prior NSF and NIH-funded workshops and awards, some of which the PI had directly participated in. The University of Tennessee provided support during the proposal process for staff time that included effort to identify additional sources of material related to education in mathematical biology, as well as support for a staff member to visit another NSF-funded Center to learn about their educational and information technology. The PI had direct knowledge and contacts with three other NSF-funded Centers during the proposal development process, including the Mathematical Biosciences Institute (MBI) at Ohio State University (the PI had served two years as Chair of the MBI Board of Governors, so was quite knowledgeable about their activities), the National Center for Ecological Analysis and Synthesis at the University of California at Santa Barbara, and the National Evolutionary Synthesis Center at Duke University. Additionally, the proposal development process benefited from discussions with the leadership of the National Center for Computational Science, an NSF-supported Center based at the University of Tennessee, particularly in areas of education and outreach to the broader biology community on matters related to high performance computing.