2010 Annual Report
National Institute for Mathematical and Biological Synthesis

Reporting Period, September 2009 – August 2010
Submitted to the National Science Foundation, April 2010

Annual Report for Period: 09/2009 - 08/2010
Submitted on: 04/30/2010
Principal Investigator: Gross, Louis J.
Award ID: 0832858
Organization: U of Tennessee Knoxville
Submitted By:
Gross, Louis - Principal Investigator
Title:
National Institute for Mathematical and Biological Synthesis (NIMBioS)

Project Participants

Senior Personnel

Name: Gross, Louis
Worked for more than 160 Hours: Yes
Contribution to Project:
Louis Gross supervised and coordinated all activities of NIMBioS. This included: hiring NIMBioS staff, coordinating activities of the Associate Directors, organizing meetings of the Advisory Board, communicating with potential participants in NIMBioS activities, communicating the NIMBioS mission to numerous institutions through formal and informal presentations, communicating activities with leaders of other NSF BIO Centers, coordinating the renovations of NIMBioS facilities with University officials, chairing the search committee for six new faculty to be associated with NIMBioS, and communicating regularly with NSF Program Officers regarding NIMBioS plans.

Name: Gavrilets, Sergey
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Gavrilets is the NIMBioS Associate Director for Scientific Activities and member of the NIMBioS Leadership Team. He leads the assessment of requests for support in conjunction with the rest of the Leadership Team and Board of Advisors. He is also the primary organizer for a NIMBioS working group investigating processes of coalition formation.

Name: Lenhart, Suzanne
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Lenhart is the NIMBioS Associate Director for Outreach, Education, and Diversity and member of the NIMBioS Leadership Team. She oversees all outreach and education activities, supervises the Outreach and Education Coordinator, and works with the Board of Advisor?s Committee to Promote Diversity to ensure opportunities at NIMBioS are available to diverse students and researchers. She is an organizer for a NIMBioS working group investigating modeling and management of disease in feral swine within Great Smoky Mountains National Park (GSMNP) as well as NIMBioS investigative workshops evaluating optimal control/optimization questions for individual-based and agent-based models and modeling the life-cycle, stage conversion, and clonal expansion of the parasite Toxoplasma gondii.

Name: Hickling, Graham
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Hickling is the NIMBioS Associate Director for Partner Relations and member of the NIMBioS Leadership Team. He leads contact with industry partners (i.e., ESRI, IBM), government partners (i.e., Great Smoky Mountains National Park), and other supporting organizations. He is also an organizer for a NIMBioS working group investigating modeling and management of disease in feral swine within Great Smoky Mountains National Park (GSMNP) and an instructor for the NIMBioS REV program.

Name: Peterson, Cynthia
Worked for more than 160 Hours: Yes
Contribution to Project:
Dr. Peterson is the NIMBioS Associate Director for Graduate Education and member of the NIMBioS Leadership Team. She leads evaluation of applicants for NIMBioS graduate research assistantships and oversees administration of the graduate research program. She also coordinates NIMBioS connections to graduate recruitment programs at UTK including an NSF-funded IGERT and NIH-funded PEER award.

Name: Welsh, Christopher

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Welsh is the NIMBioS Deputy Director and member of the NIMBioS Leadership Team. He oversees the day-to-day operations of NIMBioS, supervises NIMBioS staff, and acts as the point of contact for post-doctoral fellows and short- and long-term visitors.

Name: Beckage, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Beckage, an associate professor of plant biology at the University of Vermont, is a sabbatical fellow at NIMBioS for the period from Jan-Jul 2010. His focus as a sabbatical fellow is using models to investigate patterns, process, and climate change in savannas. In addition he is helping lead an upper level course in use of hierarchical Bayesian models in ecology and consulting with NIMBioS post-doctoral fellows and working group/workshop participants.

Post-doc

Name: Agusto, Folashade

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Agusto is a full-time Post-doctoral Fellow at NIMBioS. Her research focus is on mathematical analysis of the transmission dynamics of bovine tuberculosis. She is also investigating optimal control of the spread of malaria super-infectivity, optimal vaccination strategies for malaria in an AA-AS-cell population, and optimal control of the effect of media coverage on an epidemic model with treatment. She is a participant in the NIMBioS working group on bovine tuberculosis, mentored a short-term visitor from Indonesia, and teaches a course in Mathematics for Life Sciences.

Name: Akcay, Erol

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Akcay is a full-time Post-doctoral Fellow at NIMBioS. His research focus is on the evolution of social behavior and the evolutionary ecology of mutualisms. He is the co-PI of the NIMBioS Function and Evolution working group and a participant in the New Soil Black Box Strategies workshop and the Coalitions and Alliances working group. He conducted seminars at NIMBioS, Cal State San Marcos, Istanbul Tech. Univ., and UC Riverside, and worked with other NIMBioS post-docs in partnership with Great Smoky Mtns National Park.

Name: Mao, Yi

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Mao is a full-time Post-doctoral Fellow at NIMBioS. Her research focus is on multiscale simulations of biomolecular systems, but she is also working on bioluminescene emission control, energy transduction in proteins, drug-resistant behaviors of HIV-1 protease, and directed evolution of peroxidase. She participated in the NIMBioS workshop on optimal control and optimization of individual- and agent-based models

Name: Godsoe, William

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Godsoe is a full-time Post-doctoral Fellow at NIMBioS. His research focus is on statistical models of organisms' distributions in relation to their environmental requirements. He is collaborating with GSMNP and other NIMBioS post-docs to look at biodiversity issues in the national park, participates in NIMBioS working groups on binary matrices and forest insect dynamics, and is assisting with the Research Experience for Undergraduates program.

Name: Bewick, Sharon

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Bewick is a full-time Post-doctoral Fellow at NIMBioS. Her research focus is on modeling local community responses to climatic change, but she is also investigating models of immune system activation. She is collaborating with GSMNP and other

NIMBioS post-docs to look at biodiversity issues in the national park, participates in the NIMBioS working group on modeling forest insect dynamics, and is assisting with the Research Experience for Undergraduates program.

Graduate Student

Undergraduate Student

Name: Richters, Ana

Worked for more than 160 Hours: Yes

Contribution to Project:

Ana is a sophomore at the University of Tennessee who works part-time for NIMBioS. She spends most of her NIMBioS time assisting the Program Evaluation Coordinator with maintenance of the NIMBioS participant database. She also assists the Event Coordinator by preparing materials for events and has taken on some responsibilities with compiling requests for support for Board and Leadership Team review. She also assisted with tracking application materials during the NIMBioS-related faculty search in fall 2009/spring 2010.

Name: Thomas, Christal

Worked for more than 160 Hours: Yes

Contribution to Project:

Christal worked part-time for NIMBioS in fall of 2009 providing general administrative support, assisting with maintenance of the NIMBioS participant database, and helping with event management.

Name: Cross, Jay

Worked for more than 160 Hours: No

Contribution to Project:

Mr. Cross assisted the NIMBioS IT staff for several weeks in fall of 2009.

Technician, Programmer

Name: Comiskey, Jane

Worked for more than 160 Hours: Yes

Contribution to Project:

Jane is a Senior Analyst for NIMBioS. She developed and maintains the NIMBioS website, provides IT support, provides coding support for scientific activities, and supports web-communications for activity participants.

Name: Fletcher, Robert

Worked for more than 160 Hours: Yes

Contribution to Project:

Rob is a graduate student working part-time for NIMBios. His role here is as part of the NIMBioS IT staff handling user problems, researching system upgrades, and developing documentation and user support.

Other Participant

Name: Peek, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Mike is the NIMBioS Information Technology (IT) Manager. He provides all IT support, basic hardware and connectivity, software and applications for collaborative services. He oversees the IT staff, which includes a high-performance computing specialist, a senior analyst, and a graduate technician/programmer.

Name: Carr, Eric

Worked for more than 160 Hours: Yes

Contribution to Project:

Eric is the NIMBioS high-performance computing (HPC) specialist. He provides support for participant HPC needs as well as IT support. He is the NIMBioS contact for development of an HPC tutorial on plant phylogenetics, and he provides scientific computing support for NIMBioS activities.

Name: Duncan, Sarah

Worked for more than 160 Hours: Yes

Contribution to Project:

Sarah is the NIMBioS Outreach and Education Coordinator. Working with the Associate Director for Outreach and Education, she has developed and managed the outreach and education activities described under Section II.

Name: Bishop, Pamela

Worked for more than 160 Hours: Yes

Contribution to Project:

Pam is the NIMBioS Program Evaluation Coordinator. She has developed evaluation instruments for NIMBioS activities both to support NSF reporting requirements and for internal assessment of the success of activities and ways to improve them. She has also spearheaded the initial development of the NIMBioS participant database and organized information sharing meetings with evaluation staff from other NSF-funded centers.

Name: Crawley, Catherine

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Crawley is the NIMBioS Communications Coordinator. She is the main point of administrative contact for media, writes press releases on NIMBioS activities, interviews visiting scientists, produces print and video pieces highlighting NIMBioS activities and research, and consults with other staff on strategies to increase awareness of NIMBioS opportunities in the scientific community.

Name: Koosman, Toby

Worked for more than 160 Hours: Yes

Contribution to Project:

Toby is the NIMBioS Business Manager. She handles all accounting, inventory, contracting, and personnel procedures and has primary responsibility for all purchasing and financial management of participant support activities. She is the direct supervisor of the Event and Travel Coordinator.

Name: Thomas, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

Jennifer is the NIMBioS Event and Travel Coordinator. She is responsible for coordinating logistics of all NIMBioS activities. This includes establishing contracts for lodging and meals, making travel arrangements for activity participants and NIMBioS staff, ensuring all needs are met during activities, and processing travel reimbursement requests from participants.

Name: Rekant, Steve

Worked for more than 160 Hours: Yes

Contribution to Project:

Veterinary student participant in REV program (June-July 2010). Steve is a 1st year veterinary student from VA-MD Regional College.

Name: Scott, Janelle

Worked for more than 160 Hours: Yes

Contribution to Project:

Veterinary student participant in REV program (June-July 2010). Janelle is a 2nd-yr veterinary student from Kansas State University.

Name: Drakes, Crystal

Worked for more than 160 Hours: Yes

Contribution to Project:

Veterinary student participant in REV program (June-July 2010). Crystal is a 1st-yr veterinary student from Kansas State University.

Name: Bahorich, Laura

Worked for more than 160 Hours: Yes

Contribution to Project:

Veterinary student participant in the summer 2009 REV program. Laura was a 2nd-yr student from University of Pennsylvania.

Name: Benally, Twyla
Worked for more than 160 Hours: Yes
Contribution to Project:
Veterinary student participant in the summer 2009 REV program. Twyla was a 1st-yr student from Washington State University.

Name: Brown, Julie Paige
Worked for more than 160 Hours: Yes
Contribution to Project:
Veterinary student participant in the summer 2009 REV program. Paige was a 2nd-yr student from University of Tennessee.

Name: DeGroot, Crystal
Worked for more than 160 Hours: Yes
Contribution to Project:
Veterinary student participant in the summer 2009 REV program. Crystal was a 1st-yr student from Michigan State University.

Research Experience for Undergraduates

Name: Collins, John
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Freshman
Home Institution: Same as Research Site
Home Institution if Other:
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Chimezie, Ijeoma
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Tennessee State University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Thai, Ngoc
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Truman State University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Bulgar, David

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Oral Roberts University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Geyer, Kelly

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Virginia Tech

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Adhikari, Samrachana

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Mount Holyoke College

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Trask, Jillian

Worked for more than 160 Hours: Yes

Contribution to Project:

High school teacher working with the REU program (June-July 2010).

Years of schooling completed: Pre-College Teacher

Home Institution: Other than Research Site

Home Institution if Other: Bearden High School

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Ojogbo, Ejebagom

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: Fisk University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Lancaster, Evan

Worked for more than 160 Hours: Yes

Contribution to Project:

High school teacher working with the REU program (June-July 2010).

Years of schooling completed: Pre-College Teacher

Home Institution: Other than Research Site

Home Institution if Other: Blackman High School

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Yang, Guang

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Freshman

Home Institution: Other than Research Site

Home Institution if Other: Appalachian State University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Massaro, Tyler

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: SUNY Geneseo

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Spence, Meredith

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: North Carolina State University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2010

REU Funding: No Info

Name: Nguyen, Luong

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Sophomore

Home Institution: Other than Research Site
Home Institution if Other: Mount Holyoke College
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Jackson, Ashley
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: North Carolina State University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Keleman, Reka
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Iowa State University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Bodiroga, Dubravka
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in REU program (June-July 2010).

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: Hood College
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2010
REU Funding: No Info

Name: Coon, Kerri
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: University of Virginia
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2009
REU Funding: REU supplement

Name: Atchley, Taylor
Worked for more than 160 Hours: Yes

Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Junior
Home Institution: Same as Research Site
Home Institution if Other:
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2009
REU Funding: REU supplement

Name: Auker, Cameron
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: Hampden-Sidney College
Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree
Fiscal year(s) REU Participant supported: 2009
REU Funding: REU supplement

Name: Bennett, Crystal
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Sophomore
Home Institution: Other than Research Site
Home Institution if Other: North Carolina A&T University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2009
REU Funding: REU supplement

Name: Fassino, Steven
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Sophomore
Home Institution: Same as Research Site
Home Institution if Other:
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2009
REU Funding: REU supplement

Name: Ferguson, Revorn
Worked for more than 160 Hours: Yes
Contribution to Project:
Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Junior
Home Institution: Other than Research Site
Home Institution if Other: North Carolina A&T University
Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree
Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Huang, Wen

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Queen's College CUNY

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Khatri, Vishnupriya

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: Duke University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Nance, James

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Sophomore

Home Institution: Other than Research Site

Home Institution if Other: Emory University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Schiermeyer, Katherine

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate participant in the summer 2009 REU program.

Years of schooling completed: Junior

Home Institution: Other than Research Site

Home Institution if Other: East Tennessee State University

Home Institution Highest Degree Granted(in fields supported by NSF): Doctoral Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Briggs-Dunn, Kimberly

Worked for more than 160 Hours: Yes

Contribution to Project:

High school teacher participant in the summer 2009 REU program.

Years of schooling completed: Pre-College Teacher

Home Institution: Other than Research Site

Home Institution if Other: Clinton High School

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Name: Sills, Ginger

Worked for more than 160 Hours: Yes

Contribution to Project:

High school teacher participant in the summer 2009 REU program.

Years of schooling completed: Pre-College Teacher

Home Institution: Other than Research Site

Home Institution if Other: Clinton High School

Home Institution Highest Degree Granted(in fields supported by NSF): Associate's Degree

Fiscal year(s) REU Participant supported: 2009

REU Funding: REU supplement

Organizational Partners

IBM

IBM is a formal organizational partner with NIMBioS and has pledged the full support of the IBM Deep Computing team and continued collaborations with projects in computational biology. An IBM researcher (Dr. Ravi Rao) is an organizer of the NIMBioS working group on multi-scale analysis of cortical networks.

BioQuest Curriculum Consortium

BioQuest and NIMBioS have collaborated to conduct several workshops at NIMBioS: the NUMB3R5 Count workshop providing data, tools, and curricular materials for teachers and faculty, the SCALE-IT Curriculum Development workshop titled 'Integrating Bioinformatics and Molecular Visualization into the Curriculum' devoted to applying biological problem solving strategies to problems in medicine, epidemiology, forensics, agriculture, and conservation, and the Computational Biology Curriculum Development Tutorial (July 2010, co-sponsored with SCALE-IT and ORNL).

Great Smoky Mountains National Park

GSMNP is a formal organizational partner with NIMBioS. GSMNP staff collaborated with NIMBioS to develop outreach and education programs and as participants in NIMBioS working groups. A presentation on opportunities for GSMNP/NIMBioS collaboration was given at the 2009 GSMNP?s annual science conference. NIMBioS and GSMNP staff are also working together on research on biodiversity issues and beginning discussions of large-scale monitoring issues.

California State University San Marcos Foundation

NIMBioS staff are working with CSUSM faculty and staff to increase underrepresented individuals in science careers, with particular connections through the NIH-funded MARC Phase II award at CSUSM.

Environmental Systems Research Institute, Inc.

ESRI is a formal organizational partner with NIMBioS prepared to provide expertise in enhancing the connection between mathematical models, computational simulation, and GIS visualization and analysis in application to biological problems.

Fisk University

NIMBioS staff are working with Fisk University faculty and staff to increase underrepresented individuals in science careers. A Fisk student is participating in the 2010 NIMBioS REU program.

IPlant Collaborative

IPLant is an NSF Center with which NIMBioS is collaborating on outreach and education projects including co-sponsoring a session at the 2009 National Assoc. of Biology Teachers Meeting. Along with the other NSF BIO Centers, we are sharing information on projects and potential research collaborations. A tutorial is being planned on use of high performance computing in phylogenetics.

Nat. Ctr for Ecological Analysis and Syn

NIMBioS communicates with NEScent, NEON, NCEAS, and IPlant to talk about possible avenues of collaboration between the institutions and centers. An education and outreach meeting was held at NESCent, and NIMBioS organized a meeting of program evaluation staff from the various centers in April 2010. There are also discussions ongoing between BIO Center Directors regarding potential collaborations on research and communication.

Nat. Evolutionary Synthesis Center

NIMBioS communicates with NEScent, NEON, NCEAS, and IPlant to talk about possible avenues of collaboration between the institutions and centers. An education and outreach meeting was held at NESCent, and NIMBioS organized a meeting of program evaluation staff from the various centers in April 2010. The Bio Center Directors are in regular discussions regarding potential collaborations on research and communication.

National Ecological Observatory Network, Inc

NIMBioS initiated communication between NEScent, NEON, NCEAS, and IPlant to talk about possible avenues of collaboration between the institutions and centers in February. An education and outreach meeting was held at NEScent for a more in-depth discussion. The Directors of these Centers are in communication to share resources and encourage new collaborations. NIMBioS hosted a NEON DSECC meeting in February 2010, and a NEON representative attended the NIMBioS-organized center program evaluation meeting in April 2010.

National Institute for Computational Sci

NICS staff collaborated with NIMBioS in development of the HPC Tutorial held in March 2009 and have consulted with NIMBioS staff on high-performance computing needs and possible future tutorials. Time on the KRAKEN super-computer operated by NICS was provided during the Tutorial and arrangements are in place for use of KRAKEN as appropriate for activities based at NIMBioS.

North Carolina Agricultural & Technical State University

NIMBioS staff are working with NC A&T faculty and staff to increase underrepresented individuals in science careers. NC A&T faculty are participating in activities at NIMBioS, and NC A&T students have participated in the NIMBioS REU program.

Scalable Computing and Leading Edge Inno

Scalable Computing and Leading Edge Innovative Technologies (SCALE-IT) is an Integrative Graduate Education and Research Training (IGERT) program funded by the National Science Foundation. It is an interdisciplinary graduate fellowship program at the University of Tennessee designed to train scientists to apply appropriate computing tools to solve quantitative problems at all scales of biology (from atom to ecosystems). NIMBioS and SCALE-IT have co-sponsored Curriculum Development workshops including two in 2009 devoted to applying biological problem solving strategies to problems in medicine, epidemiology, forensics, agriculture, and conservation and one upcoming on compuational biology in July 2010. NIMBioS and SCALE-IT also co-sponsored a series of speakers on computational biology challenges over the Spring 2009 term at UTK.

Mathematical Biosciences Institute (MBI)

MBI and NIMBioS are collaborating on a project, PUMP (also sponsored by the Society for Mathematical Biology and SIAM) to survey undergrad and graduate programs in mathematical biology around the US. The leadership teams of NIMBioS and MBI are in regular contact regarding potential collaborations, and an MBI representative attended the NIMBioS-organized center program evaluation meeting in April 2010.

Program for Excellence and Equity in Res

Program for Excellence and Equity in Research (PEER) is an NIH-funded graduate students support program at UTK. NIMBioS faculty and staff have collaborated in development of this 'program of excellence' designed to increase numbers of under-represented minority Ph.D.s in science, technology, engineering, and mathematics (STEM) fields. PEER has an emphasis on quantitative biology.

USDA-APHIS-WS-National Wildlife Research Center

USDA is a formal organizational partner with NIMBioS.?? USDA-APHIS personnel initiated the NIMBioS Bovine Tuberculosis Workshop (July 2009), participate in the Feral Hog / Pseudorabies and Bovine Tb Working Groups.?? NIMBioS contributed to Foreign Animal Disease outbreak training for USDA staff, and NIMBioS and APHIS staff are presently planning future Working Groups on Cattle Tick fever, and Wildlife Tuberculosis.

Howard Hughes Medical Institute

HHMI, through its HHMI Professor Program, sponsored the efforts of BIoQuest and Dr. Claudia Neuhauser to lead the NIMBioS co-sponsored 'Curriculum Development Workshop: Integrating Bioinformatics and Molecular Visualization into the Curriculum' in June 2009. HHMI support provided funding for attendance by faculty at this Workshop, for which NIMBioS provided facilities and staff support. NIMBioS, BioQuest, and HHMI co-sponsored the NUMB3R5 Count workshop on quantitative biology in May 2009.

University of Texas - El Paso

UTEP and NIMBioS have signed a formal partnership agreement to enhance the participation of under-represented minorities in STEM disciplines. These efforts are underway through the NIH-funded MARC Phase II award at UTEP and the Bioinformatics MS program at UTEP.

Amer. Assoc for Advancement of Science

NIMBioS is involved in the AAAS-led and NSF-funded Conference on Transforming Undergraduate Education in Biology: Mobilizing the Community for Change. NIMBioS organized a group of UTK undergraduate math and biology students to consider questions posed by AAAS for this Conference.

Project Kaleidoscope

PKAL coordinated with NIMBioS on a Webinar on undergraduate education for life science students led by the NIMBioS Director, Louis Gross.

Oak Ridge National Laboratory

A number of ORNL scientists are NIMBioS senior personnel or collaborators. NIMBioS has discussed co-sponsoring programs in biophysics.

Society For Mathematical Biology

NIMBioS and the University of Tennessee are considering hosting the Society of Mathematical Biology?s (SMB) annual meeting in 2012.

American Institute of Biological Sciences

NIMBioS Director Lou Gross is on the American Institute of Biological Sciences (AIBS) Board of Directors. NIMBioS has cooperated with the AIBS to communicate opportunities and discuss co-sponsoring an outreach and education symposium. NIMBioS staff have presented at AIBS meetings.

NSF Mathematical Sciences Institutes

NIMBioS Director and Associate Directors communicate regularly with their counterparts at the various math institutes to develop ideas for collaborative activities. NIMBioS has joined with the other math institutes in the joint initiative on Climate Change and Sustainability. www.mathinstitutes.org/climate-initiative

Howard University

NIMBioS has entered into discussions with Howard University, a minority-serving institution, to develop a partnership designed to increase the representation of underrepresented minorities in the STEM disciplines.

Tennessee State University

NIMBioS has entered into discussions with Tennessee State University, a minority-serving institution, to develop a partnership designed to increase the representation of underrepresented minorities in the STEM disciplines. A Tennessee State student is participating in the 2010 NIMBioS REU program.

Other Collaborators or Contacts

Other Collaborators or Contacts

NIMBioS is collaborating with a large number of scientists from many fields. The text below identifies individuals, their affiliations, and how they have interacted with NIMBioS.

NIMBioS BOARD OF ADVISORS

NIMBioS has a 23-member advisory board that works with the Leadership Team to evaluate requests for support, encourage collaborative research at the interface of mathematics and biology and assist in developing methods to increase the diversity of participants in NIMBioS activities. Members and their institutions are:

Chair: Alan Hastings ? University of California at Davis
Cheryl Briggs ? University of California at Santa Barbara
Carlos Castillo-Chavez ? Arizona State University
Iain Couzin ? Princeton University
Lisa Fauci ? Tulane University
James Glazier ? Indiana University
Gregory Goins ? North Carolina A & T State University
Christine Heitsch ? Georgia Institute of Technology
Susan Holmes ? Stanford University
Peter Hudson ? Pennsylvania State University
Trachette Jackson ? University of Michigan
Overtoun Jenda ? Auburn University
John Jungck ? Beloit College
Matthew Keeling ? University of Warwick
Nancy Kopell ? Boston University
Donna Koslowsky ? Michigan State University
David Krakauer ? Santa Fe Institute
Jonathan Mattingly ? Duke University
George Middendorf ? Howard University
Gary Smith ? University of Pennsylvania
DeWitt Sumners ? Florida State University
John Tyson ? Virginia Polytechnic Institute and State University
Mariel Vazquez ? San Francisco State University

SENIOR PERSONNEL

The below individuals have been actively involved in NIMBioS activities:

Armsworth, Paul -- Assistant Professor, Department of Ecology and Evolutionary Biology. He is one of the new faculty hired at UT in affiliation with NIMBioS. Dr. Armsworth is an advisor to the REU/REV program and consults with NIMBioS regularly regarding future activities.

Berry, Mike ? Prof. and Assoc. Head, Dept. of Electrical Engineering and Computer Science. Dr. Berry was a co-organizer for the NIMBioS HPC Tutorial, a member of the NIMBioS faculty search committee, and provided advice on HPC opportunities.

Ganusov, Vitaly -- Assistant Professor, UT Department of Microbiology. He is one of the new faculty hired at UT in affiliation with NIMBioS.

Gilchrist, Mike -- Asst. Prof., Univ. Tennessee Department of Ecology & Evolutionary Biology. Dr. Gilchrist is one of the organizers and instructors for the NIMBioS REU and REV program and developed a working group request for support.

Joo, Jaewook -- Assistant Professor, UT Department of Physics and Astronomy. Dr. Joo is one of the new faculty hired at UT in affiliation with NIMBioS. He is an advisor to the REU/REV program and a co-organizer of the workshop on modeling Toxoplasma gondii.

Odoi, Agricola ? Asst. Prof., Univ. Tennessee Comparative Medicine, Veterinary College. Dr. Odoi provides expertise in epidemiology, participates in the Modeling Disease in Feral Swine working group, co-organized a NIMBioS Investigative Workshop on Modeling Transmission of Bovine Tuberculosis and the subsequent working group on Bovine Tb, was a member of the NIMBioS faculty search committee, mentors NIMBioS post-docs, and is one of the instructors for the NIMBioS REV program.

O'Meara, Brian -- Assistant Professor, Department of Ecology and Evolutionary Biology. Dr. O'Meara is organizing a tutorial on use of High-performance Computing in phylogenetics. He is one of the new faculty hired at UT in affiliation with NIMBioS.

Simberloff, Dan -- Gore Hunger Prof of Environmental Science, Univ. Tennessee Department of Ecology & Evolutionary Biology. Dr. Simberloff participated in the NIMBioS Working Group examining biological problems using binary matrices and is a mentor for NIMBioS post-doctoral fellow William Godsoe.

Ubeda de Torres, Francisco -- Asst. Prof., Univ. Tennessee Department of Ecology & Evolutionary Biology. Dr. Ubeda co-organized the NIMBioS Working Group on intragenomic conflict in 2009.

UT AND ORNL SENIOR COLLABORATORS

The below individuals have participated as noted in NIMBioS activities and are part of a pool of possible post-doctoral mentors as well as providing a variety of local expertise in fields related to NIMBioS working groups:

Charles Collins, Associate Professor, UT Department of Mathematics. Dr. Collins's research focuses on numerical analysis and scientific computing with applications to continuum mechanics and other areas. He mentors NIMBioS post-doc Yi Mao.

Shigetoshi Eda, Research Associate Professor, UT Department of Forestry, Wildlife, & Fisheries. Dr. Eda is an advisor for the NIMBioS REU/REV program.

James Fordyce, Associate Professor, UT Department of Ecology and Evolutionary Biology. Dr. Fordyce mentors NIMBioS post-doc Erol Akcay.

Hong Guo, Associate Professor, UT Department of Biochemistry & Cellular and Molecular Biology. Dr. Guo mentors NIMBioS post-doc Yi Mao.

Kimberly Gwinn, Assoc. Professor, UT Entomology and Plant Pathology Department. Dr. Gwinn is one of the instructors for the NIMBioS REU and REV programs.

Thomas Hallam, Emeritus Professor, UT Departments of Ecology and Evolutionary Biology and Mathematics. Dr. Hallam has co-organized the NIMBioS Investigative Workshop on Modeling White-nose Syndrome in Bats (June 2009).

Michael Langston, Professor, UT Department of Electrical Engineering & Computer Science ? Dr. Langston was a co-organizer of the NIMBioS HPC Tutorial (March 2009).

John New, Professor, UT Department of Comparative Medicine, Veterinary College. Dr. New has been involved in the NIMBioS faculty search procedures, a member of the search committee, and provides advice and support in development of the NIMBioS REV program.

Susan Riechert, Distinguished Service Professor, UT Department of Ecology & Evolutionary Biology ? Dr. Riechert is assisting with NIMBioS outreach efforts with emphasis on the Biology in a Box program.

Nate Sanders, Associate Professor, UT Department of Ecology & Evolutionary Biology. Dr. Sanders mentors NIMBioS post-docs and is an advisor for the REU/REV program.

Chunlei Su, Assistant Professor, UT Department of Microbiology. Dr. Su is a co-organizer of the NIMBioS workshop on modeling Toxoplasma gondii.

Steven Wise, Assistant Professor, UT Department of Mathematics. Dr. Wise is an instructor for the NIMBioS REU and REV programs, discussed NIMBioS in a presentation at the SHANKS conference in May 2009, mentors NIMBioS post-docs, and looks to organize a NIMBioS working group or workshop.

Jie Xiong, Dr. Xiong is co-organizing a tutorial on use of stochastic differential equations in ecology and looking to organize a NIMBioS working group.

Xiaopeng Zhao, Assistant Professor, UT Department of Mechanical, Aerospace, and Biomedical Engineering. Dr. Zhao is a co-organizer of the NIMBioS workshop on modeling Toxoplasma gondii.

NIMBioS HPC TUTORIAL INSTRUCTORS (March 2009)

The following individuals were co-instructors in the tutorial designed to ?train the trainers? in use of high-performance computing for biologists:

Dr. Jim Ferguson, Director for Education, Outreach and Training, National Institute for Computational Studies, Univ. Tennessee/ORNL.

Dr. Christian Halloy, Research Leader, JICS UT/ORNL.

Dr. Kwai Wong, Research Scientist, Joint Institute for Computational Science at UT/ORNL.

Michael McLennan, Senior Research Scientist, Purdue University.

Tabitha Samuel, Electrical Engineering & Computer Science, University of Tennessee.

John Eblen, Electrical Engineering & Computer Science, University of Tennessee.

Dr. Scott Duke Sylvester, Post-doctoral Fellow, Department of Biology, Emory University.

Gary Rogers, Department of Computer Science, University of Tennessee.

Stan Tomov, Research Scientist, Computer Science Department, University of Tennessee.

R FOR LIFE SCIENCES INSTRUCTORS

Noelia Barrios (Department of Ecology and Evolutionary Biology graduate student) and Marco Martinez (Department of Mathematics graduate student) planned and conducted the NIMBioS-sponsored tutorial on use of R for life sciences in spring 2009.

ADDITIONAL COLLABORATORS

John Lounsbury, Professor, Department of Psychology, University of Tennessee has consulted with NIMBioS staff on program assessment and evaluation procedures.

Premal Shah, Univ. Tennessee Department of Ecology and Evolutionary Biology provided computer and audiovisual support for NIMBioS seminars.

Claudia Neuhauser (University of Minnesota- Rochester), Ethel Stanley, Sue Risseeuw, and John Jungck (all of BioQuest) collaborated with NIMBioS in planning and carrying out the NUMB3R5 Count Workshop (May 2009) and the BioQuest collaborators also co-sponsored the SCALE-IT Curriculum Development Workshops (Integrating Bioinformatics and Molecular Visualization in the Curriculum (June 2009) and Computational Biology (July 2010)).

Tamah Fridman, Joint Institute for Computational Sciences, ORNL, has planned and organized a Summer School in Biophysics: Physics and Computational Challenges in Biology and initiated discussions on NIMBioS involvement in the program. (summer 2009 and 2010)

Cathy DeWein and Gale Stanley, high school teachers, facilitated introduction of the Biology in a Box program in a number of high schools. (2009 and 2010).

GRADUATE RESEARCH ASSISTANTS

NIMBioS has supported the following graduate research assistants (GRAs):

Spring 2009:
Erin Bodine, Department of Mathematics;
Rachel Leander, Department of Mathematics ? Biology in a Box;
Marco Martinez, Dept. of Mathematics ? R Tutorial for Life Sciences

2009/2010 academic year:
Erin Bodine, Department of Mathematics;
Ivan Juric, Ecology and Evolutionary Biology;
Rachel Leander, Department of Mathematics ? Biology in a Box;
and Premal Shah, Ecology and Evolutionary Biology.

NIMBioS will support four GRAs for the 2010/2011 academic year as well, beginning in August 2010:
Yuzhuo Chu, Dept. Biochemistry, Cellular and Molecular Biology;
Mauricio Gonzalez-Forero, Dept. Ecology and Evolutionary Biology;
Premal Shah, Dept. Ecology and Evolutionary Biology;
and Henian Xia, Dept. Mechanical, Aerospace, and Biomedical Engineering.

SHORT-TERM VISITORS

The following individuals have visited (or will visit prior to August 31, 2010) NIMBioS for collaborative research efforts:

Rene Salinas, Asst. Professor, Appalachian State Univ. Collaborated with Dr. Suzanne Lenhart and Dr. Frank van Manen on Using Dynamic Model Feedback for Optimization of Individual-based Models (2009) and with NIMBioS scientific staff on visualizations/modeling related to the feral hogs working group (2010).

Renee Fister, Dept. Mathematics, Murray State Univ.; Elsa Schaefer, Dept. Mathematics, Marymount Univ.; Holly Gaff, Virginia Modeling, Analysis and Simulation Center, Old Dominion Univ.; Rachael Miller, Dept. Mathematics, Univ. Tennessee.
These researchers met with Dr. Suzanne Lenhart at NIMBioS to collaborate on disease modeling. (May 2009)

Maria Leite, Department of Mathematics, University of Oklahoma; Zhilan Feng, Department of Mathematics Purdue University; Jorge Velasco-Hernandez, Programa de Matem?ticas Aplicadas y Computaci?n Instituto Mexicano del Petr?leo.
Project Title: Coupling within- and between-host dynamics in HIV
These researchers met to work on Coupling Within- and Between-Host Dynamics in HIV and on Models for the Characterization and Prediction of Outbreaks of Dengue Fever Based on Spatially Explicit Information. (July 2009)

Ilki Kim, Dept. Physics, North Carolina A&T University.
Dr. Kim visited NIMBioS to meet with UT and ORNL collaborators with the goal of gaining information to help build a research program in biophyics at NC A&T.
(August 2009)

C?line Devaux, Marie Curie Fellow, Imperial College, London.
Project Title: Spatial ecological model of sympatric speciation of palm trees
C?line Devaux is collaborating with Sergey Gavrilets (Univ. Tennessee) to develop and test ecological and neutral models of speciation that can describe the emergence of two sympatric species of palms trees endemic to Lord Howe Island. (October 2009)

Eti Wiraningsih, Mathematics Dept., Universitas Gadjah Mada, Indonesia.
Project Title: Competing species model with an infectious disease and time delay
Ms. Wiraningsih visited NIMBioS with support from the Directorate General for Higher Education of Republic of Indonesia. While here she collaborated with Dr. Suzanne Lenhart, Dr. Fola Agusto, and others to develop an optimal control in SEIR model for rabies between dogs and humans with vaccination effect. (November 2009 ? February 2010)

Jean Michel Tchuenche, Dept. Mathematics and Statistics, Univ. of Guelph, Canada.
Project Title: Optimal Vaccination Strategies for Malaria in an AA-AS Population
Jean Michel Tchuenche is collaborating with Suzanne Lenhart (Univ. Tennessee) and Folashade Agusto (NIMBioS) to formulate a deterministic model for malaria transmission in individuals with dominant homozygous gene (AA-cell) and individuals with sickle-cell trait (AS-cell), in order to theoretically assess the benefit of the control strategies on the transmission dynamics of malaria in individuals with AA-cell against individuals with AS-cell natural resistance. (December 2009)

Brian Beckage, Dept. Plant Biology, Univ. of Vermont.
Project Title: Using models to investigate patterns, process, and climate change in savannas
Brian Beckage's research focuses on dynamics of forests, including disturbance and dynamics in savanna communities, climate change and

ecological communities, tree invasions, and forest diversity. (December 2009)

Jason Miller, Dept. Mathematics and Computer Science, Truman State Univ.
Project Title: Training in multi-scale modeling for research and teaching
Jason Miller is training in mathematical and computational modeling for the purpose of advancing personal research and teaching in an undergraduate program in mathematical biology. The training objective is to acquire skills in multiscale modeling of biological phenomena with direction from professional modelers at NIMBioS. (December 2009)

Ellen Simms, Dept. Integrative Biology, Univ. of California, Berkeley.
Project Title: Modeling nodulation dynamics of legumes
Ellen Simms is collaborating with Erol Ak?ay (NIMBioS) modeling nodulation dynamics of legumes. (January 2010)

Jason Hoeksema, Dept. Biology, Univ. Mississippi; Sarah Richardson, Environmental Sciences Program, DePaul Univ.; Ellen Simms, Dept. Integrative Biology, UC Berkeley; Antonio Golubski, Dept. Ecology & Evolutionary Biology, Univ. of Toronto; and Miro Kummel, Dept. Environmental Science, Colorado College. (James Umbanhower, Dept. Biology, Univ. of North Carolina, Chapel Hill was part of this group but was ill and unable to travel to NIMBioS).
Project Title: Production economics of mutualism: Rhizobial bail-outs to the domatia bubble
These individuals met with Dr. Erol Akcay (NIMBioS post-doc) to develop a general framework for using economic theory to model how mutualisms evolve and how they create and respond to ecological change. (February 2010)

Judith Canner, Biomathematics Program, North Carolina State Univ.
Project Title: The effects of climate change on ant population dynamics and ant-plant mutualisms
To understand the factors controlling the seasonal abundance of ants, Judith Canner is collaborating with Sharon Bewick (NIMBioS) and Katie Stuble (Univ. of Tennessee) to develop a stage-structured model of colony dynamics. The goal is to understand how temperature, which alters the developmental and mortality rates of eggs, larvae and pupae, can influence the seasonal abundance of workers in the colony and, ultimately, colony survival. (March 2010)

Jeremy Van Cleve, Santa Fe Institute.
Project Title: Exploring two-tier models of social behavior in structured populations
Jeremy Van Cleve is collaborating with Erol Ak?ay (NIMBioS) to explore two-tier models of social behavior in structured populations. (March 2010)

Emily Moran, Dept. Biological Sciences, Duke University.
Dr. Moran visited NIMBioS to develop a collaboration network on use of individual-based and population models to investigate plant genotype-specific responses to environmental changes. (April 2010)

Scott Duke-Sylvester, Dept. Biology, Univ. Louisiana ? Lafayette and Chris Ellingwood, Botany Dept., Univ. Vermont.
Project Title: Spatial modeling of Everglades plant community response to natural and man-made disturbance.
Dr. Duke-Sylvester and Dr. Ellingwood will visit NIMBioS to collaborate with NIMBioS Sabbatical Fellow Dr. Brian Beckage and NIMBioS scientific staff Jane Comiskey and Eric Carr and compose a detailed outline of new simulations to investigate the response of Everglades plant communities to alternative hydrologic scenarios. (planned for May 2010)

Kerrie Anne Loyd, Warnell School of Forestry and Natural Resources, Univ. Georgia.
Project Title: A stochastic modeling approach to feral cat management and prey take
Ms. Loyd will visit NIMBioS to collaborate with Dr. Louis Gross and Jane Comiskey from NIMBioS as well as Dr. Paul Armsworth (Univ. Tennessee, NIMBioS Sr. Personnel) and Dr. Yetta Jager (Environmental Sciences Division, ORNL, NIMBioS Sr. Collaborator) on development of improved stochastic models for feral cat management. (planned for May/June 2010)

Michael Tildesley, Centre for Infectious Diseases, Institute of Immunology and Infection Research, University of Edinburgh, UK and Sadie Ryan, National Center for Ecological Analysis and Synthesis, UC-Santa Barbara.
Project Title: Using GIS to inform spatial epidemic models of disease transmission among US farms
Drs. Tildesley and Ryan will meet to investigate the geographical resolution required to accurately predict future epidemics of foot-and-mouth disease in the US, and to create model frameworks that can be adapted to other livestock diseases such as Bovine tuberculosis and Brucellosis. (planned for June-July 2010)

Richard Hall, Odum School of Ecology, Univ. Georgia; John Lambrinos, Dept. Horticulture, Oregon State Univ.; Gregory Schrott, Archbold Biological Station; and Hiroyuki Yokomizo, National Institute for Environmental Studies, Japan.

Project Title: Modeling the effects of habitat fragmentation and biotic resistance on biological invasions
These researchers will meet to synthesize ecological theory, computational modeling, and empirical data to understand how habitat fragmentation interacts with local biotic resistance to drive invasion patterns. (planned for July 2010)

Yoram Louzoun, Dept. Mathematics, Bar Ilan Univ., Israel.
Project Title: Optimal viral immune surveillance evasion strategies
Dr. Louzoun will work with Dr. Vitaly Ganusov (University of Tennessee, NIMBioS Sr. Personnel) to build a generic framework for viral properties evolutionary optimization analysis as well as developing multidisciplinary collaborations to adapt ideas and concepts from ecology to immunology. (planned for July/Aug 2010)

POST-DOCTORAL FELLOWS

NIMBioS has five Post-doctoral Fellows as of March 2010 (Folashade Agusto, Erol Akcay, Sharon Bewick, William Godsoe, and Yi Mao). Six more have accepted positions but have not yet started at NIMBioS:

Xavier Thibert-Plante (Dept. Biology, McGill University) starts in May 2010.

Thomas Ingersoll (Dept. Environmental Science, Policy, and Management, Univ. California-Berkeley) will start in June 2010.

Shade Shutters (School of Life Sciences, Arizona State University and Applied Economics Dept., University of Vigo, Spain) is scheduled to start in July 2010.

Tucker Gilman (Dept. Zoology, University Wisconsin ? Madison) ? Sept. 2010.

Emily Moran (Dept. Biological Sciences, Duke University) ? Sept. 2010.

Tony Jhwueng (Dept. Mathematics, Indiana Univ.) ? October 2010.

SABBATICAL FELLOWS

NIMBioS has one Sabbatical Fellow in residence (Dr. Brian Beckage, Jan-Jul 2010). Vlastimil Krivan, Chair, Department of Theoretical Ecology, Biology Center, Academy of Sciences of the Czech Republic has accepted a NIMBioS Sabbatical Fellowship to begin in July 2010. Dr. Krivan will study links between animal behavior, population dynamics, and evolutionary processes that preserve biodiversity by combining game theoretical methods to describe animal behavior with differential equations describing population dynamics. (July ? December 2010)

Activities and Findings

Research and Education Activities:
Year 1 submission:

From the beginning of the reporting period through the end of May, 2009, 204 different people (68% male; 32% female) participated in 12 NIMBioS sponsored events. Participants came from 89 cities across 10 countries, including 33 different states in the U.S. Included in these participants were 172 different researchers from 99 institutions, of which there were 9 NIMBioS residents, 12 scientists from the University of Tennessee, and 151 scientists visiting from other institutions. In addition to these researchers, there were 20 graduate students and 10 undergraduate students participating. The 172 participating researchers came from 82 different colleges or universities, 8 private research institutions, 3 non-profit organizations, and 6 government institutions.

Projected for the month of June, 2009, NIMBioS is scheduled to host approximately 115 different participants during six events, including 72 researchers from 55 different institutes. Visiting researchers are expected to come from 53 cities across 4 countries, including 26 different states in the U.S. Also included are 10 NIMBioS residents, 3 scientists from the University of Tennessee, and 59 scientists visiting from other institutions, 15 4th-8th grade students, 16 undergraduate students, and 2 high school teachers.

Events scheduled for July and August will bring the total of major activities over this first year to seven working groups, three workshops, two tutorials, two advisory board meetings, and five short-term visitors. In addition the NIMBioS Leadership Team has given over 40 talks about NIMBioS since January 1, 2009 at a wide variety of gatherings.

Year 2 SUMMARY

From June 1, 2009 - April 30, 2010, 563 different people (57% male; 43% female) participated in 30 NIMBioS sponsored events. Participants came from 22 countries, including 42 different states in the U.S., as well as Puerto Rico. A total of 223 different institutions were represented, including colleges or universities (86%), government institutions (9%), private businesses (2%), and non-profit organizations (2%). Also included were three high schools. Participants from these institutions were college/university faculty (42%), undergraduate students (20%), graduate students (14%), government employees (8%), postdoctoral researchers, (7%), private business employees (3%), college/university staff (2%), non-profit employees (2%), and college/university administrators (1%). Also in included were three high school teachers. Around 5% of participants indicated being of Hispanic/Latino ethnicity. The majority of participants reported their race as white (60%), although Asian (10%), black/African American (5%), Native Hawaiian/Pacific Islander (.1%), and American Indian/Alaska Native (2%) races were also represented (23% of participants chose not to report their race, and 24% chose not to report ethnicity). In Year 2 (Sept 2009 - August 2010) NIMBioS will have hosted 13 Working Group meetings, 4 Investigative Workshops, 3 Tutorials, 23 Short-term Visitors, 2 Sabbatical Fellows, and more than 15 Outreach and Education activities.

OVERALL SUMMARY (cumulative)

From January 1, 2009 to April 30, 2010, 722 different people (59% male; 41% female) participated in 42 NIMBioS sponsored events. Participants came from 26 countries, including 45 different states in the U.S., as well as Puerto Rico. A total of 268 different institutions were represented, including colleges or universities (87%), government institutions (7%), private businesses (.5%), and non-profit organizations (3%). Also included were three high schools. Participants from these institutions were college/university faculty (44%), undergraduate students (17%), graduate students (16%), government employees (7%), postdoctoral researchers, (7%), private business employees (2%), college/university staff (4%), non-profit employees (3%), and college/university administrators (1%). Also in included were three high school teachers. Around 4% of participants indicated being of Hispanic/Latino ethnicity. The majority of participants reported their race as white (54%), although Asian (9%), black/African American (4%), Native Hawaiian/Pacific Islander (.1%), and American Indian/Alaska Native (2%) races were also represented (30% of participants chose not to report their race, and 31% chose not to report ethnicity). By the end of Year 2, NIMBioS will have hosted 20 Working Group Meetings, 6 Investigative Workshops, 4 Tutorials, 31 Short-term Visitors, 2 Sabbatical Fellows, and more than 30 Outreach and Education activities.

Major Research and Educational Activities (through April 30, 2010)

Year 1: Advisory Board Meetings, 1 on-site and 1 virtual. These meetings were held to refine NIMBioS procedures and goals and to evaluate requests for support, including for working groups, workshops, sabbatical visitors, and post-doctoral fellows.

Year 2: Advisory Board Meetings, 1 on-site and 1 virtual. These meetings were held to refine NIMBioS procedures and goals and to evaluate requests for support, including for working groups, workshops, sabbatical visitors, and post-doctoral fellows.

Working Group on Coalitions and Alliances
Organizers: Sergey Gavrilets, Departments of Mathematics and Ecology & Evolutionary Biology, University of Tennessee, Knoxville; Frans B. M. de Waal, Psychology Department, Emory University
The goal of this working group is to bring together empiricists and theorists to identify the most promising ways for building a testable quantitative theory of coalition formation. 11 participants
Dates: April 2009 (11 participants); February 2010 (11 participants)

Working Group on Intragenomic Conflict
Organizers: Francisco Ubeda de Torres, Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville; Andy Gardner, Ashworth Laboratories, Edinburgh, UK; Jon Wilkins, Santa Fe Institute, Santa Fe, NM
This working group brings together biologists working on intragenomic conflict and mathematicians interested in evolutionary theory. The questions to be answered by the working group are related to the differences and commonalities between conflicting genes and what types of models work best for modeling intragenomic conflict.
Date: April 2009 (15 participants)

Working Group on Feral Swine / Pseudo-rabies in Great Smoky Mountains National Park

Organizers: Graham Hickling, Department of Forestry, Wildlife and Fisheries, Institute of Agriculture, University of Tennessee, Knoxville, and Director, Center for Wildlife Health; Suzanne Lenhart, Mathematics Department, University of Tennessee, Knoxville; Leslie Real, Biology Department, Emory University
This working group focuses on the problem of managing pseudo-rabies virus and other disease agents among feral swine within Great Smoky Mountains National Park.
Dates: April 2009 (15 participants); January 2010 (15 participants)

Working Group on Use of Binary Matrices in Biology
Organizers: Edward F. Connor, Department of Biology, San Francisco State University; Joshua Ladau, Gladstone Institutes, San Francisco
The Binary Matrices working group focuses on null model tests of binary data. The goal of the Binary Matrices Working group is to bring together biologists, statisticians, and mathematicians to address ways to improve quantitative inference from binary data in biology.
Dates: May 2009 (10 participants); December 2009 (11 participants)

Working Group for Synthesizing and Predicting Infectious Disease while Accounting for Endogenous Risk (SPIDER)
Organizers: Eli Fenichel, Arizona State University, School of Life Sciences; Carlos Castillo-Chavez, Arizona State University, Department of Mathematics and Statistics; Peter Daszak, Consortium for Conservation Medicine, New York, NY; Rick Horan, Michigan State University, Department of Agricultural, Food, and Resource Economics; Charles Perrings Arizona State University, School of Life Sciences
The SPIDER working group comprises disease ecologists, economists, and mathematicians working to develop predictive models both to forecast the risks associated with emerging infectious diseases in humans, livestock, wildlife, and plants, and to assist in the development of risk management strategies.
Dates: June 2009 (14 participants); November 2009 (11 participants)

Working Group for Integrating Functional and Evolutionary Dynamics at Multiple Scales
Organizers: Erol Akcay and Joan Roughgarden, Department of Biology, Stanford University
This working group models the dynamics of biological systems at the functional and evolutionary levels and works toward integrating the two in a unified framework.
Dates: June 2009 (10 participants); March 2010 (8 participants)

Investigative Workshop for Modeling White Nose Syndrome in Bats at the Individual and Colony Levels: Epizootiology and Management
Organizers: Thomas G. Hallam and Gary F. McCracken, Department of Ecology and Evolutionary Biology, University of Tennessee, Knoxville
The purpose of this meeting was to develop modeling directions to help assist in the understanding of the temporal and spatial scales, the pathology, and the physiology of bats during WNS stress and ultimately to lead to managed control of the disease.
Date: June-July 2009 (35 participants)

Investigative Workshop on Modeling the Impact of Cattle Movements on Transmission Dynamics of Bovine Tuberculosis
Organizers: Colleen Webb, Department of Biology, Colorado State University, Fort Collins; Agricola Odoi, Department of Comparative Medicine, University of Tennessee, Knoxville
Experts from across the globe met to discuss cutting-edge approaches to model bovine TB transmission in the United States, with the goal of developing a model that would help inform policy on TB control strategies.
Date: July 2009 (38 participants)

Working Group on Population and Community Ecology Consequences of Intraspecific Niche Variation
Organizers: Daniel Bolnick, Section of Integrative Biology, University of Texas at Austin; Volker Rudolf, Department of Ecology & Evolutionary Biology, Rice University; Kevin McCann, Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada
The working group uses mathematical models to determine whether, and how, niche variation alters the dynamics of classical models of single-species, predator-prey, and community interactions. It comprises biologists and mathematicians familiar with 1) empirical patterns of niche variation; 2) theoretical quantitative genetics, population genetics, foraging theory, and neural networks; and 3) mathematical models of population, predator-prey, and food web dynamics.
Date: July 2009 (15 participants)

Investigative Workshop on New Strategies for the Black Box: Identifying Mathematical Tools for Elucidating Plant-Soil Interactions
Organizers: Alison E. Bennett (Department of Entomology, University of Wisconsin); James Umbanhowar (Department of Biology, University of North Carolina)
The purpose of this workshop was to build a comprehensive picture of plant-soil interactions that can then inform basic science as well as applied science, including restoration, conservation, and global change. Theoretical frameworks for expanding our knowledge and driving the future of plant-soil interactions were identified.

Date: October 2009 (33 participants)

Investigative Workshop on Optimal Control and Optimization for Individual-based and Agent-based Models
Organizers: Filippo Castiglione, Institute for Computing Applications, Rome; Volker Grimm, UFZ Center for Environmental Research, Leipzig; Reinhard Laubenbacher, Virginia Bioinformatics Institute; Suzanne Lenhart, University of Tennessee, Knoxville
This workshop brought together researchers working in agent-based models, optimal control, and optimization to discuss the possible development of control theoretic approaches for agent-based models, beginning with the ones mentioned above.
Date: December 2009 (43 participants)

Working Group on Darwinian Morphometrics: Cross-Topology Registration of Shape
Organizers: Patrick A. Carter, School of Biological Sciences, Washington State University; Richard Gomulkiewicz, Department of Mathematics and School of Biological Sciences, Washington State University; David Houle, Department of Biological Science, Florida State University; J. Stephen Marron, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill
This group aims to develop a much deeper understanding of the biological processes that underlie differences in form, by the novel approach of integrating biological hypotheses directly into the geometric operation of registration and the resulting statistical analysis. The group?s activities synthesize the development of appropriate hypotheses with methods of registration not previously considered by evolutionary biologists, such as point distribution models, voxel based space warps, and medial models, to produce logical and systematic methods of analysis.
Dates: January 2010 (16 participants)

Working Group on Modeling Bovine Tuberculosis
Organizers: Colleen Webb, Colorado State University, Department of Biology and Department of Mathematics and Agricola Odoi, University of Tennessee, Department of Comparative Medicine
This group of experts in network and simulation modeling, bovine TB and control and eradication strategies addresses questions regarding the sources and spread of bovine TB in areas with high local prevalence and at the national scale and how understanding the sources and spread of bovine TB can be used to inform control and eradication strategies.
Dates: February 2010 (13 participants)

Working Group on Synthesizing Predictive Modeling of Forest Insect Dynamics Across Spatial and Temporal scales
Organizers: Mario Pineda-Krch and Mark Lewis, Centre for Mathematical Biology, Department of Mathematical and Statistical Sciences, University of Alberta, Canada and Andrew Liebhold, Northern Research Station, USDA Forest Service
The aim of the working group is to synthesize cutting edge predictive modeling approaches using several case studies based on historical outbreak data. The group consists of leading researchers engaged in developing an understanding of the complex ecological, evolutionary, and environmental processes governing the dynamics of forest insect pest.
Dates: February 2010 (14 participants)

Working Group on Food Web Dynamics and Stoichiometric Constraints in Meta-Ecosystems
Organizers: Mathew Leibold, Section of Integrative Biology, University of Texas at Austin; Robert W. Sterner, Dept. Ecology Evolution and Behavior, University of Minnesota; Francois Massol, CEMAGREF, Aix en Provence, France; Chris Klausmeier, Kellogg Biological Station, Michigan State University
This working group addresses important questions at the community/ecosystem interface and works toward synthesizing the two theoretical approaches to food web/ecosystem dynamics, i.e., ecological stoichiometry and meta-community/ecosystem theory.
Dates: April 2010 (9 participants)

Planned research/educational activities, May 1 ? Sept. 1, 2010:

Working Group on Use of Binary Matrices in Biology, 3rd meeting, May 2010

Investigative Workshop on Modeling Toxoplasma gondii
Organizers: Xiaopeng Zhao, Biomedical Engineering Dept., University of Tennessee, Knoxville; Chunlei Su, Department of Microbiology, University of Tennessee, Knoxville; Jitender P. Dubey, Laboratory of Parasitic Diseases, United States Department of Agriculture; Michel Langlais, Institut Mathematiques de Bordeaux, Universite Victor Segalen Bordeaux; Suzanne Lenhart, Department of Mathematics, University of Tennessee, Knoxville; Jaewook Joo, Department of Physics and Astronomy, University of Tennessee, Knoxville
This workshop aims to explore mathematical tools and problems in describing the life cycle, stage conversion, and clonal expansion of T. gondii by bringing together expertise in parasitic diseases, epidemiology, population genetics, disease modeling, network dynamics, evolutionary dynamics, and nonlinear analysis.
Date: May 2010

Working Group on Multi-Scale Analysis of Cortical Networks
Organizers: A. Ravishankar Rao, IBM Research and Ehud Kaplan, Mt. Sinai School of Medicine
This group composed of researchers with a wide range of backgrounds, ranging from mathematical physics to computer science to neuroscience will use statistical network theory as a unifying mathematical model to analyze neuroscientific data across multiple levels of abstraction, ranging from single neuron to whole brain.
Date: May 2010

Working Group on Population and Community Ecology Consequences of Intraspecific Niche Variation, 2nd meeting, June 2010

Investigative Workshop on Modeling the Sustainability of Coral Reef Ecosystem Services Under Multiple Interacting Stressors
Organizers: Susan Harrell Yee, U.S. EPA, Gulf Ecology Division and Jerald S. Ault, University of Miami, Rosenstiel School of Marine & Atmospheric Science
This workshop will evaluate the potential for development of a comprehensive coral reef systems model that links multiple interacting environmental stressors (e.g., water quality, exploitation, episodic events, climate changes, and vessel groundings) to the state and dynamics of reef ecosystems stretching from coastal bays to coral reefs.
Date: July 2010

Working Group on Feral Swine / Pseudo-rabies in Great Smoky Mountains National Park, 3rd meeting, August 2010

Findings:

Activities at NIMBioS have led to more than 25 publications on research over this year ranging across many areas of applied mathematics, epidemiology, evolution, ecology and conservation biology. These publications involved over 40 researchers and appeared in over 15 different journals. These publications described numerous applications of mathematical approaches including how savanna systems are maintained under disturbance, how combinations of alternative methods to control the spread of cholera may be developed in an optimal manner, whether sexual selection is a necessary mechanism to explain various behaviors, and how to utilize statistical models to analyze global scale species distributions accounting for niche variation.

Training and Development:

Major Opportunities for Training, Development, and Mentoring (through April 30, 2010)

R Seminar
The R Seminar for statistical computing was co-sponsored by NIMBioS and the University of Tennessee?s Department of Ecology and Evolutionary Biology. The purpose of the seminar was to help students learn to use the R statistics package in biological research. The format of the seminar was one hour a week for six weeks.
Date: January 2009 (20 participants)

NIMBioS Tutorial: High-Performance Computing
Training the Trainers: High-Performance Computing Tutorial for Computational Science Professionals Collaborating with Biologists. This NIMBioS High Performance Computing (HPC) Tutorial focused on disseminating the tools necessary for organizations and individuals to leverage computational resources for research at the interface of biological/computational/mathematical research.
Date: March 2009 (33 participants)

Research Experiences for Undergraduates and Veterinary Students (REU/REV)
Veterinary students and undergraduates majoring in math, biology, and related fields lived on campus and worked in teams with UT professors on interdisciplinary research projects for eight weeks. Each research project had a math mentor and a biology or vet mentor. Ten undergraduates, four veterinary students and two high-school teachers participated.
Date: June-July 2009

Curriculum Development Workshop: Integrating Bioinformatics and Molecular Visualization into the Undergraduate Biology Curriculum
NIMBioS, SCALE-IT, and BioQuest co-sponsored 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 was on creating teaching units that apply biological problem solving strategies to real problems in medicine, epidemiology, forensics, agriculture, and conservation.
Date: June 2009 (18 participants)

NIMBioS Tutorial: Optimal Control and Optimization for Biologists
Organizers: Suzanne Lenhart, University of Tennessee, Department of Mathematics and Michael Bevers, USDA Forest Service, Fort Collins, Colorado
The tutorial introduced selected topics in optimal control and optimization with an emphasis on biological applications and will include lectures and interactive computer lab sessions.
Date: July 2009 (37 participants)

Mathematica Technical Seminar
NIMBioS hosted Wolfram Research for two technical seminars on use of Mathematica 7 in the sciences. These focused on applications of Mathematica for teaching and research.
Date: September 2009
PUMP (Panel on Undergraduate Math Biology)
Held at MBI (Mathematical Biosciences Institute), this activity is organized by MBI, SIAM, and SMB. S. Duncan attended an initial meeting and a follow up conference call, which has led to a collaborative wiki for the panel. The goal is to produce a report that will serve as a resource for individuals and institutions developing initiatives in quantitative biology for undergraduate students.

Vision and Change in Undergraduate Biology Education
Year 1: L. Gross participated in the AAAS Vision and Change Committee on Undergraduate Biology Education. A student mini-conversation was held at NIMBioS in April 2009 with 11 participants to determine which issues the students find most pressing, and how to best use student input for the Vision and Change Steering Committee for Educational Reform reports.
Year 2: S. Duncan submitted a report on the discussion to AAAS along with student nominations to attend the AAAS Visions and Change Conference, July 2010. Two students from UTK were nominated by NIMBioS to attend. Louis Gross also attended the conference in Washington, D.C.

Teacher Collaboration Program
This program provides links between teachers, scientists, and educators with interest in mathematical biology. Math or biology/science teachers interested in making connections between the fields are encouraged to participate. NIMBioS matches participants from different communities in a bi-directional partnership to enhance the cross-disciplinary approach to mathematics and biology. The program currently has 26 participants.

Planned training/development opportunities, May 1 ? Sept. 1, 2010:

Research Experiences for Undergraduates and Veterinary Students
Veterinary students and undergraduates majoring in math, biology, and related fields lived on campus and worked in teams with UT professors on interdisciplinary research projects for eight weeks. Each research project had a math mentor and a biology or vet mentor. The participants include 14 undergraduates, three veterinary students and two high-school teachers.
Dates: June-July 2010

NIMBioS Tutorial: Computational Biology Curriculum Development
This tutorial, co-sponsored by NIMBioS and other partners, will focus on helping graduate students and faculty develop curriculum resources and teaching approaches that reflect modern biological problem solving as well as engage students with the use of emerging computational tools and data.
Date: July 2010

NIMBioS Tutorial: Graph Theory and Biological Networks
This tutorial is designed to teach participants how graph theory can inform their understanding of many common biological patterns that are graphs.
Date: August 2010

Outreach Activities:

Outreach and Education are a significant component of NIMBioS activities. These activities cover a broad audience from elementary school (Kids U), middle school (Girls in Science), high school (teacher collaboration and math/biology curriculum programs), and undergraduates (Biology in a Box, undergraduate math/biology majors conference, Mu Alpha Theta annual meeting) to graduate students and general science population (seminars, presentations). Various institutional partner visits were made, including visits to the Mathematical Biosciences Institute, the All Taxa Biodiversity Inventory project and the Science Symposium at Great Smoky Mountains National Park, Fisk University, NC AT&T and Tennessee State for partnering with minority-serving institutions.
Institutional Partner visits, as well as visits to the University of Texas-El Paso and California State Univ.-San Marcos. The section below describes NIMBioS outreach and education activities completed through April 30, 2010.

Joint Math Meetings
Co-sponsored with NSF Mathematics Institutes, the Joint Mathematics Meetings are held in Washington, D.C., for the purpose of advancing mathematical achievement, encouraging research, and to provide the communication necessary to progress in the field. NIMBioS and the Mathematics Institutes sponsored an open-house with presentations on opportunities available through these NSF-funded Institutes.
Date: January 2009

Earthfest 2009, Knoxville, TN and Earth Day 2009, Oak Ridge, TN
NIMBioS representatives handed out flyers and talked to the public attending these events.

Webinar: Mathematics and Life Science Education: Promoting Interdisciplinarity
L. Gross led this Webinar, which explored the possibilities of a multi-pronged approach to integrate quantitative ideas throughout the biology curriculum. Co-sponsored with Project Kaleidoscope (PKAL).
Date: April 2009 (28 participants)

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.
Date: May 2009 (17 participants)

Computational Biology Seminar Series
Co-Sponsored by the Scalable Computing and Leading Edge Innovative Technologies (SCALE-IT) graduate fellowship program, NIMBioS, Department of Biochemistry, Cellular, & Molecular Biology and Graduate School of Genome Science and Technology (GST), there were a total of 11 seminars presented by researchers in computational biology over the spring term 2009.

Kids U at the University of Tennessee
S. Duncan and S. Lenhart led a week-long summer course for 4-8th grade students called Biology by Numbers! Students learned about scientific inquiry, conducted their own group research project, and analyzed data using graphs and measures of central tendency.
Date: June 2009

Great Smoky Mountains National Park (GSMNP) Outreach
GSMNP Science Teachers Workshop at Tremont
S. Duncan and S. Lenhart lead a session introducing NIMBioS and taught a module created by NIMBioS to examine biodiversity and illustrate a quantitative biological lesson for students.
Date: June 2009 (35 participants)
Girls in Science Biodiversity Session at the GSMNP, Tremont
Duncan and Lenhart lead a session to introduce NIMBioS, promote girls in science, and illustrate quantitative biology with a salamander diversity module.
Date: June 2009 (25 participants)

Mu Alpha Theta
NIMBioS contributed to the 2009 Mu Alpha Theta National Convention in Knoxville by providing speakers and facilitating campus tours for students. Mu Alpha Theta is the national high school mathematics honor society.

Date: July 2009

Undergraduate Research Conference at the Interface Between Biology and Mathematics
Faculty and Minority Serving Institution partners and high school teachers were invited to see the research of these undergraduates. The conference included student talks and posters, a guest plenary speaker, and a meeting of NSF UBM PIs. The conference also featured a panel to take questions about research and careers in math biology. Nearly 200 undergraduates and faculty from more than 40 academic institutions in North America participated in the conference. There were 40 undergraduate research talks and 35 student posters.
Date: October 2009

Tennessee Academy of Sciences
S. Duncan and S. Lenhart presented NIMBioS at a booth at the Tennessee Academy of Sciences meeting at the University of Tennessee, Knoxville.
Date: October 2009

NIMBioS Multidisciplinary Job Candidate Seminars
Job candidate 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, and Microbiology.
Year 1: 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.
Year 2: There were a total of six job candidate presentations for faculty positions associated with the NIMBioS search with attendance of 30-50 people at each seminar.

NIMBioS Interdisciplinary Seminars
The Tuesday Interdisciplinary Seminar Series was held on alternating Tuesdays during the fall and spring semesters 2009-2010. There were a total of ten presentations. On Tuesdays for which no formal seminar is scheduled, NIMBioS hosts an Afternoon Tea for NIMBioS staff, visitors, faculty, and post-docs as well as faculty and students from across the UT community. The teas provide an opportunity for informal collaboration, discussion and networking. Occasionally, the teas provide a forum for other talks of interest at NIMBioS; one such talk was held in spring 2010.

Biology in a Box
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.
Year 1: S. Duncan, R. Leander and S. Lenhart partnered with Biology in a Box at the University of Tennessee to add math exercises to the boxes. Workshops to teach how to use the boxes were prepared by S. Riechert and facilitated by G. Stanley and K. DeWein at Elizabethton High School, Elizabethton, TN (6/2009); Walter Hill School, Rutherford Co, TN (8/2009); and McMinn County School System, Athens, TN (8/2009)
Year 2: S. Duncan taught a Biology in a Box session with 80 participants at an annual regional Girl Scout meeting, Knoxville, TN, Sept. 26, 2009. Informational presentations about Biology in a Box were given by S. Riechert at the University of Tennessee's Outreach Conference and also UT's Howard Baker Center (January 2010) and by G. Stanley at the National Science Teachers Association Annual Meeting (March 2010). Workshops to teach how to use the boxes were prepared by S. Riechert and facilitated by G. Stanley and K. DeWein at Vance Middle School, Bristol, TN (January 2010); Meigs Middle School, Meigs County, TN (January 2010); Monroe County School System, TN (February 2010); Henry County Schools EW Grove School, Paris, TN (February 2010); Crossville Cumberland County Schools, TN (March 2010). Another workshop is planned for Warren County School System, TN (May 2010).

Coordinators for Education, Outreach and Communication (CEOC)
Year 1: In February and April 2009, C. Crawley and S. Duncan organized conference call meetings between NEScent, NEON, NCEAS, iPlant, NEON, and MBI to talk about possible avenues of collaboration between the institutions and centers.
Year 2: In October 2009, C. Crawley and S. Duncan attended the first annual Coordinators for Education, Outreach and Communication collaborative meeting with the NSF biology centers including NCEAS, NEScent, iPlant, EOL, BioSync, AIBS and NEON. This meeting focused on sharing resources and knowledge in education, outreach and communication. The first annual meeting was held at NEScent. Duncan and Crawley participated in follow up conference calls in January, March and April 2010. The second annual meeting of CEOC is planned for September 2010 at NCEAS.

Junior Science Symposium

NIMBioS hosted visiting high school Junior Science Symposium students for an introductory session to NIMBioS and a quantitative biodiversity module created by NIMBioS. The session had 33 participants including students and teachers.
Date: February 2010

Evaluation Meeting for Biology Research and Education Centers
P. Baird organized and attended a collaborative evaluation meeting held at NIMBioS for NSF biology-related research and education centers whose purpose was to learn from each of the other centers about evaluation best practices and plan for future evaluation initiatives.
Date: April 2010

Planned Outreach Activities, May 1 - Sept. 1, 2010:

NIMBioS/UBM Award
NIMBioS is offering financial support to help undergraduate students attend the Beyond BIO2010 Celebration and Opportunities Conference to be held May 21-22, 2010, at the National Academy of Sciences in Washington D.C. The NIMBioS/UBM Award covers transportation to and from the conference for ten undergraduate students currently participating in the NSF UBM programs across the United States.

Biology in a Box Summer Workshop for Teachers
Twenty local teachers and six out of state teachers will explore the new mathematical exercises added to the Biology in a Box units by NIMBioS in this interactive workshop.
Date: June 2010

Great Smoky Mountains National Park
NIMBioS will lead quantitative biology sessions for the Girls in Science week at Tremont (June 2010) and for the Institute for Science Teachers at Tremont (June 2010). NIMBioS will also help host the Advanced Teacher Workshop at Tremont (August 2010).

SIAM Conference on Life Sciences
S. Lenhart will present a mini-symposium at the conference along with speakers from MBI and NEScent.
Date: July 2010

Coordinators for Education, Outreach and Communication Annual Meeting
C. Crawley and S. Duncan will attend the second annual Coordinators for Education, Outreach and Communication collaborative meeting with the NSF biology centers including NCEAS, NEScent, iPlant, EOL, BioSync, AIBS and NEON. This meeting focuses on sharing resources and knowledge in education, outreach and communication.
Date: September 2010

SACNAS Annual Conference
NIMBioS submitted a session proposal for the 2010 fall SACNAS Annual Conference in collaboration with SCALE-IT and PEER.
Date: September 2010

NIMBioS PRESENTATIONS:

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-SIGMAA 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 Tennesseee 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. Hickling, S. Lenhart

Wildlife and Rabies Symposium, Univ. of Tennessee Institute of Agriculture, Knoxville, TN. Rabies and wildlife: An introduction, April 2009, G. Hickling

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

USDA-APHIS Wildlife Seminar for Emergency Animal Disease Preparedness, Athens, GA, Managing endemic wildlife disease: bovine TB in New Zealand as a case, May 2009, G. Hickling

Research presentations at Complex Trait Community Annual Meeting, Manchester, UK, Characterizing the gut microbiome in relation to host intestinal mRNA in collaborative cross progenitors and Extracting and validating gene-phenotype association networks using the ontological discovery environment, May 2009, M. Langston et. al.

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

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

International Symposium: Origin of Species, 150 years later, Kristineberg, Sweden, Dynamics of adaptive radiation, June 2009, S. Gavrilets

Invited talk at Congress of the European Academy of Allergology and Clinical Immunology, Warsaw, Poland, High-throughput computation can help identify key molecular response networks in allergic disease, June 2009, M. Langston

TeraGrid 09, Arlington, VA, Generating exact solutions to difficult combinatorial problems on extremely large graphs using out-of-core techniques, June 2009, M. Langston et. al.
NIMBioS informational talk at Institute for Mathematics and its Applications, Univ. of Minnesota, June 12, 2009, S. Lenhart

Invited international talk for Mathematical Modeling and Analysis of Ecological Systems Symposium at the First Joint Meeting of the Society for Mathematical Biology and the Chinese Society for Mathematical Biology, Hangzhou, China, Space, control and population biology? June 14-17, 2009, L. Gross

Invited international talk at Xi'an Jiangtong University, Xi'an, China, Multiscale modeling, space and control of natural systems, June 19, 2009, L. Gross

Interview on WBIR Channel 10 News, Knoxville, TN, Tick-borne disease, July 2009, G. Hickling

Imperial College London, UK, Dynamics of adaptive radiation, July 2009, S. Gavrilets

15th International Congress of Speleology, Kerrville, Texas, White-Nose Syndrome in hibernating bats: Are these affected bats the next 'canary in the mine?' July 2009, T. H. Kunz, D. S. Blehert, P. M. Cryan, J. H. Coleman, A. Hicks, M. D. Tuttle

Invited talk at DOE EPSCoR Program Review Workshop, Brookhaven National Laboratory, Upton, NY, Scalable computational methods for the analysis of high-throughput biological data, July 2009, M. Langston

University of California at Davis Workshop on Graduate Education at the Interface of Biology and Mathematics, Davis, CA, Some lessons from 30 years of interdisciplinary graduate education, July 8, 2009, L. Gross

AAAS/NSF Vision and Change: Undergraduate Biology Education for the 21st Century, Washngton DC. Serve on Steering Committee and co-chaired sessions on Concepts and Skills for all Biology Students, July 14-17, 2009, L. Gross

Invited talk at Mu Alpha Theta National Convention, Knoxville, The power of optimal control, July 21, 2009, S. Lenhart

Mu Alpha Theta Annual Conference, Knoxville, TN, What's math got to do with it? Connections between math and biology at NIMBioS, July 23, 2009, L. Gross

NIMBioS informational talk at Society of Mathematical Biology Meeting, Vancouver, Canada, July 27, 2009, S. Lenhart

NIMBioS informational talk at ORNL Brown Bag lunch for summer student researchers, July 30, 2009, C. Peterson.

CODIGEOSIM Workshop on Geosimulation and Mathematical Modeling for Zoonotic Disease, York Univ., Toronto, Persistence and spread of the agent of Lyme disease in low-density, emerging blacklegged tick populations, Aug. 2009, G. Hickling

Ecological Society of America, Albuquerque, Dynamics of adaptive radiation, August, 2009, S. Gavrilets

Invited talks at Ecological Society of America Annual Meeting Albuquerque, NM.
Symposium on Undergraduate Ecological Education, Undergraduate Biology Education: Bio2010 Revisited and Workshop on Big Models in

Ecology, Introductory Presentation, The good, the bad, the ugly are all possible outcomes, August 4-8, 2009, L. Gross

Invited workshop at Radford University, Radford, VA, Mathematics and life science education: Promoting interdisciplinarity, August 24, 2009, L. Gross

Invited plenary talk, Young Investigators Workshop, Mathematical Biosciences Institute, Optimal control of two models of rabies in raccoons, Aug. 25, 2009, S. Lenhart

Workshop on Metapopulations, La Foully, Switzerland, Dynamics of adaptive radiation, Sept. 2009, S. Gavrilets

Invited community colloquium, York University, Toronto, Canada, The power of optimal control, Sept. 10, 2009, S. Lenhart

University of Tennessee Pre-Football Game Showcase Talk, Knoxville, Computational ecology: Environmental problem-solving for the 21st century, Sept. 12, 2009, L. Gross

Invited distinguished lecture, Middle Tennessee State University, The power of applied math, Sept. 17, 2009, S. Lenhart

Epi-Group presentation, Univ. of Tennessee Institute of Agriculture, Knoxville, TN, The ecology of tick-borne disease in Tennessee, Oct. 2009, G. Hickling

Department of Biology, University of Idaho, Moscow, Dynamics of adaptive radiation, Oct. 2009, S. Gavrilets

OSC2 DIVERSITAS Conference, Cape Town South Africa, The parallels of emerging infectious diseases and biological invasions: the biology behind an economic risk model, Oct. 2009, C. Jerde, P. Daszak, D. Finnoff, D. Lodge, K. Smith

Phi Zeta Research Symposium, Michigan State University's College of Veterinary Medicine, Spatial epidemiology of campylobacteriosis in East Tennessee., Oct. 2009, C. DeGroot

Department of Anthropology, State University of Washington, Pullman, Cycling in the complexity of early societies, Oct. 2009, S. Gavrilets

Invited keynote address for Second International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems, Integrating into the future: NIMBioS and the math/biology interface, Oct. 9, 2009, L. Gross

NIMBioS presentation to SACNAS Board, Oct. 14-17, 2009, C. Peterson.

Conference opening talk for NIMBioS Undergraduate Research Conference at the Interface Between Biology and Mathematics, What's math got to do with it? Connections between math and biology at NIMBioS, Oct. 23, 2009, L. Gross

National Academy Board on Life Sciences, Washington DC, Multiscale modeling, space and control of natural systems, Oct. 27, 2009, L. Gross

Talk to Directors, National Institutes of Food and Agriculture, USDA, Washington, DC, 'NIMBioS: Synergies with agricultural sciences, Oct. 28, 2009, L. Gross

International Workshop: 150 Years after Darwin: From Molecular Evolution to Language, Palma de Mallorca, Spain, Dynamics of adaptive radiation, Nov. 2009, S. Gavrilets

Invited talk, RTI International Fellows Symposium, Research Triangle Park, NC, The interface of mathematics, biology and computing: Successes and a look to the future, Nov. 3, 2009, L. Gross

Seminar at the Univ. of Vermont, Structural studies on a pair of circulatory proteins: Cofactors or cohorts in crime? Nov. 13, 2009, C. Peterson

Invited workshop, National Association of Biology Teachers Annual Conference, Denver, CO, Computational thinking in biology for all students, Nov. 13, 2009, L. Gross

Centripitals Lecture, Univ. of Tennessee, Knoxville, Fostering interdisciplinarity in research and education: NIMBioS and beyond, Nov. 18, 2009, L. Gross

Seminar at Maryville College, Maryville, TN, A pair of circulatory proteins: Cofactors or cohorts in crime? Nov. 20, 2009, C. Peterson

Invited talk at International Workshop on Parameterized Complexity and Approximation Algorithms, Schloss Dagstuhl, Germany, Parameterized algorithms for string correction problems, Dec. 2009, M. Langston et. al.

Research talk, NIMBioS Investigative Workshop: Optimal Control and Optimization for Individual-based and Agent-based Models, Adapting optimal control from a simple aggregated model to an individual-based model, Dec. 1, 2009, L. Gross

Outreach seminar (NIMBioS: A New National Institute to Foster Mathematical and Biological Linkages) and a research seminar (The games of nature: New approaches to evolutionary game theory) at Cal State Univ. San Marcos, Dec. 1, 2009, E. Akcay

Research Presentation at Georgia State Univ., An unexpected role for metals in regulating the activity of a serine protease inhibitor, PAI-1, Dec. 16, 2009, C. Peterson

Research seminar (The games of nature: New approaches to evolutionary game theory, Dec. 19, 2009) and a public lecture (Social evolution theory, Dec. 21, 2009), Istanbul Technical University, Istanbul, Turkey, E. Akcay

Systems Approaches in Immunology, Santa Fe, New Mexico, Growth detection: A mechanism for immune system decision-making, Jan. 2010, S. Bewick

NIMBioS informational talk at MAA session on Enrichment Activities for Math Majors, Joint Math Meetings, San Francisco, Jan. 13, 2010, S. Lenhart

Invited talk, Joint Mathematics Meetings MAA Symposium on Mathematical Modeling in Environmental Sciences, San Francisco, CA, Environmental modeling and big projects: Lessons from everglades restoration planning, Jan. 14, 2010, L. Gross

Research seminar, UC Riverside, Cooperation in animals, plants and bacteria: Why the ?how? is important, Jan. 14, 2010, E. Akcay

Farragut High School Science Academy, Knoxville, Computational ecology: Environmental problem-solving for the 21st century, Jan. 26, 2010, L. Gross

Vanderbilt University, Darwin's Day, Dynamics of adaptive radiation, Feb. 2010, S. Gavrilets

2nd Berlin Bat Meeting: Bat Biology and Infectious Diseases, Germany, Impact of White-Nose Syndrome on ecosystem services provided by insectivorous bats, Feb. 2010, T. Kunz, W. Frick, J. Pollock, R. Scott Reynolds

Informal presentation, Dept. of Homeland Security, Washington, DC, Moving NIMBioS forward: Collaborations with sponsoring agency partners, Feb. 2, 2010, L. Gross

Outreach and research presentations at Middle Tennessee State Univ., Opportunities for WISE women at the University of Tennessee (Feb. 3) and New insights for an old couple: Regulation of a protease and its inhibitor (Feb. 4), 2010, C. Peterson

National Academy of Sciences Workshop on Computational Thinking for Everyone, Remote Presentation to Workshop in Washington, DC, Computational thinking, models and data: Comments from thirty years of effort at the math/biology interface, Feb. 4, 2010, L. Gross

Invited seminar, Fisk University, The power of optimal control: from controlling rabies to CPR, Feb. 11, 2010, S. Lenhart

Invited talk and workshop, Univ. of Nevada Las Vegas UBM Program, Mathematics and life science education: Promoting interdisciplinarity, and Space and control in natural systems, Feb. 12, 2010, L. Gross

EEB seminar, North Carolina State University, How do we test for coevolution in nature, Feb. 16, 2010, W. Godsoe

Symposium introduction as organizer, AAAS Annual Meeting, San Diego, CA, Moving across scales: Mathematics for investigating biological hierarchies, Feb. 21, 2010, L. Gross

Washington University, St Louis, Dynamics of ecological speciation, March 2010, S. Gavrilets

Southeastern Sectional Meeting, Lexington, KY, The Cahn-Hilliard-Hele-Shaw equations: Applications in biological growth, March 2010, S. Wise
Invited talk at Institute of Biological Engineering Annual Conference, Cambridge, MA, Scalable high performance algorithms and implementations, with application to the analysis of high-throughput biological data, March 2010, M. Langston

Research presentations at UT-ORNL-KBRIN Bioinformatics Summit, Cadiz, KY, Graph algorithms for machine learning: A case-control study based on prostate cancer populations and high throughput transcriptomic data; Inferring gene coexpression networks for low dose ionizing radiation using graph theoretical algorithms and systems genetics; and Serendipitous discoveries in microarray analysis, March 2010, M. Ecology and Evolution of Infectious Disease P.I. Meeting, Atlantic City, NJ, Blacklegged tick phenology and behavior: Implications for Lyme disease in southern states, March 2010, G. Hickling

Invited seminar, University of Kentucky, Optimal control of harvesting models, March 2, 2010, S. Lenhart

Invited talks, Arizona State Univ., Tempe, AZ, Mathematics and life science education: Promoting interdisciplinarity, Space and control in natural systems, Trees as engineers: Lessons from some mathematical models in plant biology, and Computational thinking, models and data: Comments from thirty years of effort at the math/biology interface, March 4-5, 2010, L. Gross

Langston et. al. EEB seminar, Louisiana State University, I can't define the niche but I know it when I see it, March 15, 2010, W. Godsoe

NIMBioS informational talk. National Science Teachers Association Annual Meeting. March 19, 2010, S. Duncan

Presentation at Rhodes College, Building a biological camera: 3D snapshots of a pair of regulatory proteins, March 29, 2010, C. Peterson

International HIV Dynamics & Evolution Conference, Monterey, CA, Quantifying factors determining the rate of CTL escape and reversion during acute and chronic phases of HIV infection, April 2010, V. Ganusov

Informal presentation, UTK Undergraduate Mathematics Conference, NIMBioS: Opportunities for graduate students, April 10, 2010, L. Gross

Research seminar, UC Berkeley, The evolution of games and how to play them, April 22, 2010, E. Akcay

UTK Mathematics Department Junior Colloquium, What's math got to do with it? Connections between math and biology at NIMBioS, April 22, 2010, L. Gross

Invited talk, Beyond Bio2010 Symposium, Washington, DC, Getting ahead in math bio ed: Toward a national plan for undergraduate quantitative life science education, May 22, 2010, L. Gross

Keynote talk, HHMI Conference on Mathematics and Biology Education, Univ. of Delaware, Wilmington, Mathematics and life science education: Promoting interdisciplinarity, June 10, 2010, L. Gross

Journal Publications

Akcay E, Van Cleve J, Feldman MW, Roughgarden J, "A theory for the evolution of other-regard integrating proximate and ultimate perspectives", PNAS, p. 19061, vol. 106, (2009). Published,

Duenez-Guzman EA, Mavarez J, Vose MD, Gavrilets S, "Case studies and mathematical models of ecological speciation: Butterflies in a jungle", Evolution, p. 2611, vol. 63, (2009). Published,

Fitzpatrick BM, Fordyce JA, Gavrilets S, "Pattern, process, and geographic modes of speciation", Journal of Evolutionary Biology, p. 2342, vol. 22, (2009). Published,

Reichard JD, Kunz TH, "White-Nose Syndrome inflicts lasting injuries to the wings of little brown myotis (Myotis lucifugus)", Acta Chiropterologica, p. 457, vol. 11, (2009). Published,

Rice WR, Gavrilets S, "Sexually antagonistic chromosomal cuckoos", Biology Letters, p. 686, vol. 5, (2009). Published,

Sadedin S, Hollander J, Panova M, Johannesson K, Gavrilets S, "Case studies and mathematical models of ecological speciation: Ecotype formation in a Swedish snail", Molecular Ecology, p. 4006, vol. 18, (2009). Published,

Yahara K, Fukuyo M, Sasaki A, Kobayashi I, "Evolutionary maintenance of selfish homing endonuclease genes in the absence of horizontal transfer", PNAS, p. 18861, vol. 106, (2009). Published,

Akcay, E, "The evolution of payoff matrices", Proc. of the Royal Society B., p. , vol. , (2010). Submitted,

Collins C, Fister KR, Williams M, "Optimal control of a cancer cell model with delay", Mathematical Modeling of Natural Phenomena, p. , vol. , (2010). Published,

Fenichel EP, Horan RD, Hickling GJ, "Bioeconomic management of invasive vector-borne diseases", Biological Invasions, p. , vol. , (2010). Published,

Frick WF, Reynolds DS, Kunz TH, "Influence of climate and reproductive timing on demography of little brown myotis (Myotis lucifugus)", Journal of Animal Ecology, p. 128, vol. 79, (2010). Published,

Godsoe, W, "Regional variation exaggerates ecological divergence in niche models", Systematic Biology, p. 298, vol. 59, (2010). Published,

Godsoe W, "I can't define the niche but I know it when I see it: A formal link between statistical theory and the ecological niche", Oikos, p. 53, vol. 119, (2010). Published,

Miller NR, Schaefer E, Gaff H, Fister KR, Lenhart S, "Modeling optimal intervention strategies for cholera", Bulletin of Mathematical Biology, p. , vol. , (2010). Published,

Riechert SE, Post BK, "From skeletons to bridges and other STEM enrichment exercises for high school biology", American Biology Teacher, p. 20, vol. 72, (2010). Published,

Roughgarden J, Akcay E, "Do we need a sexual selection 2.0?", Animal Behaviour, p. e1, vol. 79(3), (2010). Published,

Roughgarden J, Akcay E, "Final response: sexual selection needs an alternative", Animal Behaviour, p. e18, vol. 79(3), (2010). Published,

Wise SM, "Unconditionally stable finite difference, nonlinear multigrid simulation of the Cahn-Hilliard-Hele-Shaw system of equations", J. Sci. Comput., p. , vol. , (2010). Published,

Travis CB, Gross LJ, Johnson BA, "Tracking the gender pay gap: A case study", Psychology of Women Quarterly, p. 410, vol. 33, (2009). Published,

Beckage B, Platt WJ, Gross LJ, "Vegetation, fire, and feedbacks: A disturbance-mediated model of savannas", The American Naturalist, p. 805, vol. 174, (2009). Published,

Gavrilets S, Losos JB, "Adaptive radiation: Contrasting theory with data.", Science, p. 732, vol. , (2009). Published,

Books or Other One-time Publications

Gavrilets S, Vose A, "Dynamic patterns of adaptive radiation: evolution of mating preferences", (2009). chapter, Published
Editor(s): In Butlin, RK, J Bridle, and D

Schluter
Collection: Speciation and Patterns of Diversity
Bibliography: Cambridge University Press, pp. 102-126

Miller Neilan R, Lenhart S, "Introduction to optimal control with an application in disease modeling", (2010). chapter, Accepted
Collection: Modeling Paradigms and Analysis of Disease Transmission Models
Bibliography: American Mathematical Society, DIMACS

Ding W, Lenhart S, "Introduction to optimal control for discrete time models with an application to disease modeling", (2010). chapter, Accepted
Collection: In: Modeling Paradigms and Analysis of Disease Transmission Models
Bibliography: American Mathematical Society, DIMACS Volume

Bodine E, Lenhart S, Gross L, "Mathematics for the Life Sciences", (2010). Book, in progress
Bibliography: Text in draft form

Duenez-Guzman EA, Vose A, Vose M, Gavrilets S, "Simulating population genetics on the XT5", (2009). Conference Proceeding, Published
Collection: Proc. of the Compute the Future Cray Users Group Conference, Atlanta
Bibliography: Conference Proceeding

Post BK, Riechert SE, "Bridging the gap: Biology and engineering in the high school curriculum", (2009). Conference Proceeding, Published
Collection: Proc. Of ASEE SE Conference, Marietta, Georgia
Bibliography: Conference Proceeding

Abu-Khzam FN, Fernau H, Langston MA, Lee-Cultura S, Stege U, "A fixed-parameter algorithm for string-to-string correction", (2010). Conference Proceedings, Published
Collection: Proc. of Computing: the Australasian Theory Symposium, Brisbane, Australia
Bibliography: Conference Proceeding

Web/Internet Site

URL(s):
www.NIMBioS.org
Description:
The NIMBioS website, nimbios.org, became operational October 1, 2008. Visitor traffic is monitored by Google Analytics. For the period October 1, 2008 through April 27, 2010, NIMBioS.org received 46,327 visits and 156,276 page views from 22,208 unique visitors, spending an average of 3.39 minutes on site and viewing an average of 3.37 pages per visit. Forty-eight percent of visitors viewed a single page; 15 percent viewed more than 5 pages. Visits have originated from 3,983 cities in 131 countries, using 66 languages. Over 50 percent of visits are identifiable as originating from colleges or universities. Direct traffic has accounted for 35 percent of visits, search engines 38 percent, and referring sites 27 percent. The site currently has 297 html pages and 115 pdf documents. Pages with the highest visitor traffic include the front page, personnel pages, calendar/announcements, education page, and pages describing research opportunities for postdoctoral fellows, undergraduates, working groups, and workshops.

Other Specific Products

Product Type:

Proposals

Product Description:

Kunz TH, Sorenson MD. 2010-2013. Assessing population genetic structure and gene flow in the little brown myotis, Myotis lucifugus. Morris Animal Foundation. $196,759. Pending.

Sharing Information:

Public has open access to any results/findings stemming from proposals.

Product Type:

Proposals

Product Description:

Kunz TH, Sorenson MD, Hallam TG, McCracken GF, Barton HA, Reeder DM. 2010-2013. Collaborative Research: White-nose syndrome?an emerging infectious diseases of North American hibernating bats. National Science Foundation. $855,995. Pending.

Sharing Information:

Public has open access to any results/findings stemming from proposals.

Product Type:

Proposals

Product Description:

Pannkuk, EL, Risch T, Benjamin E, Gilmore D, Huss M. 2010. Lipid analysis of Arkansas bat integument, fungal fatty acid metabolism, and control of white-nose syndrome in Arkansas. Arkansas State Wildlife Grants. $42,790. Pending.

Sharing Information:

Public has open access to any results/findings stemming from proposals.

Product Type:

Proposals

Product Description:

Pannkuk EL, Risch T, Savary B, Gilmore D, Huss M. 2009. Fungal digestion of chiropteran integument. National Speleological Society. $5,800. Accepted.

Sharing Information:

Public has open access to any results/findings stemming from proposals.

Product Type:

Meetings

Product Description:

Tridane A, Pasour V. March 2010. Mathematical modeling in life sciences: Control and optimization, 34th SIAM Southeastern-Atlantic Section Conference, North Carolina State University.

Sharing Information:

Conferences are open to interested participants.

Product Type:

Teaching aids

Product Description:

Martinez M. 2010. R for biologists: An introductory guide.
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
March 19, 2010. Toxoplasmosis (Length: 3:01; 122 views)
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
February 23, 2010. Interview with Dr. Katie A. Portacci (Length: 2:42; 98 views)
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
November 11, 2009. Interview with Dr. Gary An (Length: 3:25; 113 veiws)
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
November 11, 2009. Interview with Dr. Alan Hastings (Length: 2:11; 136 views)
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
November 11, 2009. Interview with Dr. Karen Garrett (Length: 3:03; 51 views)
Sharing Information:
Available at nimbios.org

Product Type:
Audio or video products
Product Description:
November 5, 2009. BioSongs Project 2009 (Length: 2:59; 169 views)
Sharing Information:
Available at nimbios.org

Product Type:

Audio or video products

Product Description:

September 1, 2009. Modeling the Bear Population in Appalachia (Length: 4:01; 377 views)

Sharing Information:

Available at nimbios.org

Product Type:

Audio or video products

Product Description:

July 27, 2009. Interview with Dr. Sebastian Schreiber (Length: 2:48; 262 views)

Sharing Information:

Available at nimbios.org

Product Type:

Audio or video products

Product Description:

July 27, 2009. Interview with Dr. Gail Wolkowicz (Length: 2:34; 226)

Sharing Information:

Available at nimbios.org

Product Type:

Audio or video products

Product Description:

June 15, 2009. Biology By Numbers! (Length: 1:25; 127 views)

Sharing Information:

Available at nimbios.org

Product Type:

Audio or video products

Product Description:

June 10, 2009. Interview with Dr. Joan Roughgarden (Length: 2:16; 712 views).

Sharing Information:

All videos are available online through nimbios.org.

Product Type:

Audio or video products

Product Description:

June 7, 2009. Interview with Dr. Peter Daszak (Length: 2:57; 235 views)

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2010. The NIMBioS nexus: Creating interdisciplinary connections to solve biological problems. Higher Ground, The Online Magazine of the Univ. of Tennessee College of Arts & Sciences

Sharing Information:

Available to the public on the University of Tennessee's website.

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Examining human behavior and the threat of disease. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Searching for solutions to evolutionary puzzles. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. The value of variation: Ecologists consider causes and consequences. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Can ants, and the plants that rely on them, take the heat? NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Scientist ties distribution modeling to ecological theory. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Mathematic models help formulate strategies for controlling infectious disease. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2010. Darwinian morphometics and the problem of shape. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2010. Species distribution models can exaggerate differences in environmental requirements. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2010. A mad itch: Controlling pseudo-rabies in feral swine. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Trees facilitate wildfires as a way to protect their habitat. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. The evolution of social behavior: Cooperation and conflict. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Multiscale simulations reveal protein form and function. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Plotting herds to eradicate bovine tuberculosis.
NIMBioS Online.

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009 Unraveling the mystery of white-nose syndrome. NIMBioS
Online

Sharing Information:

Available at nimbios.org

Product Type:

Feature Articles

Product Description:

Crawley, C. 2009. Tackling a math problem for ecology. NIMBioS Online.

Sharing Information:

Available at nimbios.org

Contributions

Contributions within Discipline:

NIMBioS is inherently an interdisciplinary institute with crosscutting activities involving mainly biology and mathematics, with connections to many other disciplines. A primary goal of NIMBioS is to address key biological questions using appropriate mathematical methods. During our first full year of operation, NIMBioS fostered interactions in several different areas of both math and biology, involving a broad array of researchers from many disciplinary backgrounds including behavioral biologists, ecologists, evolutionary biologists, anthropologists, geneticists, psychologists, bioinformaticians, veterinarians, epidemiologists, physicians and wildlife biologists. Mathematicians and statisticians from many sub-disciplines of these fields participated, as well as computational scientists with particular expertise in high performance computing.

Contributions to Other Disciplines:

An objective of NIMBioS is to bring together individuals from numerous disciplines to collaborate on new research projects, consider new areas that might benefit from contact with various fields of math and biology and foster communication between disciplines. As a few examples from activities held this year, a variety of individuals with mainly separate backgrounds in biology or mathematics attended a Tutorial to provide
them with the conceptual foundations and skills to utilize optimal control approaches in a variety areas of application to the life sciences; a continuing working group on binary matrices brought together ecologists working on food webs, network biologists, and conservation biologists with statisticians who have expertise in applying emerging statistical methods to field data; a Workshop on Bovine Tuberculosis brought together mathematical modelers, veterinarians, geographers and epidemiologists to consider methods to utilize USDA data to estimate potential likelihoods and impacts of this disease in the US; and NIMBioS sponsored the first gathering of mathematical modelers and epidemiologists to consider models for the spread of white-nosed syndrome in bats across the US.

Contributions to Human Resource Development:

Numerous outreach activities focused on providing information on how mathematics contributes to biology to various audiences. This included perhaps the largest gathering of undergraduates carrying out research at the interface of mathematics and biology sponsored through the NSF UBM program; a summer program providing research experiences for an interacting group of undergraduates from biology and mathematics, high school science teachers and graduate students in veterinary medicine; collaboration with high school teachers in addition of mathematics curricular components to the Biology in a Box program; and numerous talks to undergraduate and graduate student audiences about what NIMBioS is and how the interface between math and biology is important in developing new techniques for significant societal problems as well as investigating basic biology. Several graduate students were supported through NIMBioS cost-share arrangements to collaborate on activities and expand their own expertise - these students were from both mathematics and biology degree programs. Six postdoctoral fellows were supported to carry out research that was approved by the NIMBioS Advisory Board on biological questions at several different levels, ranging from protein structure to global-scale analysis of species distribution patterns.

Contributions to Resources for Research and Education:

The project compiled as a guide to the statistical package R for life scientists that is posted on the NIMBioS web site. The project supported the development of a new text on mathematics for life scientists designed for an entry-level course sequence which was published in a first draft edition for use by approximately 300 students over the year and is and being further evaluated and classroom-tested this coming academic year. The project is also supporting the development of quantitative components of the Biology-in-a-Box set of activities, so that these materials and the boxes may be utilized in both biology and mathematics classrooms in middle and high schools. The project brought on-line a computer cluster for use by participants in NIMBioS activities.

Contributions Beyond Science and Engineering:

Several Working Groups at NIMBioS are focused on issues related to public policy, including: the Working Group on Feral Swine/Pseudo-rabies in Great Smoky Mountains National Park, which is addressing issues of management of a wild population arising from concerns about the potential for disease spread from the wild population to domestic livestock; the Working Group on White-Nose Syndrome in Bats, which is developing modeling protocols for determining the potential spread and impact of this fungal disease which is affecting bat populations in many US states; and the Working Group on Bovine Tuberculosis dealing with the sources and spread of bovine TB in areas with high local prevalence and at the national scale and how understanding the sources and spread of bovine TB can be used to inform control and eradication strategies. All of these activities are intended to be used to inform public policy decisions by Federal and State officials.

Conference Proceedings

Rogers, GL;Perkins, AD;Phillips, CA;Eblen, JD;Abu-Khzam, FN;Langston, MA, Using Out-of-Core Techniques to Produce Exact Solutions to the Maximum Clique Problem on Extremely Large Graphs, "MAY 10-OCT 13, 2009", 2009 IEEE/ACS INTERNATIONAL CONFERENCE ON COMPUTER SYSTEMS AND APPLICATIONS, VOLS 1 AND 2, : 374-381 2009

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Evaluation Summary Report of NIMBioS Activities Year Two

April 1, 2009-March 31, 2010

National Institute for Mathematical and Biological Synthesis
March, 2010

Evaluation Summary of Major NIMBioS Activities

Executive Summary

This is a report of NIMBioS evaluated activities during the second annual reporting period (RP 2) to the National Science Foundation. The report covers the period of April 1, 2009-March 31, 2010. During RP 2, 618 different people from 249 institutions participated in NIMBioS sponsored activities. Research program activities during RP 2 included:

- 10 Working Groups (with a total of 15 meetings)
- 4 Investigative Workshops
- 20 Short-term visitors
- 6 Postdoctoral Fellows
- 1 Sabbatical Fellow
- 6 Graduate Research Assistantships

Education and outreach program activities during RP 2 included:

- 1 Tutorial
- 4 Education/Outreach Workshops
- A NIMBioS Seminar Series
- Biology by Numbers (Kids U at the University of Tennessee)
- Research Experiences for Undergraduates/Veterinary Students Program
- Mu Alpha Theta 2009 National Convention
- Vision and Change Undergraduate Education Reform Meeting
- Undergraduate Conference at the Interface between Mathematics and Biology
- Project Kaleidoscope Webinar
- Teacher Collaboration Program Pilot

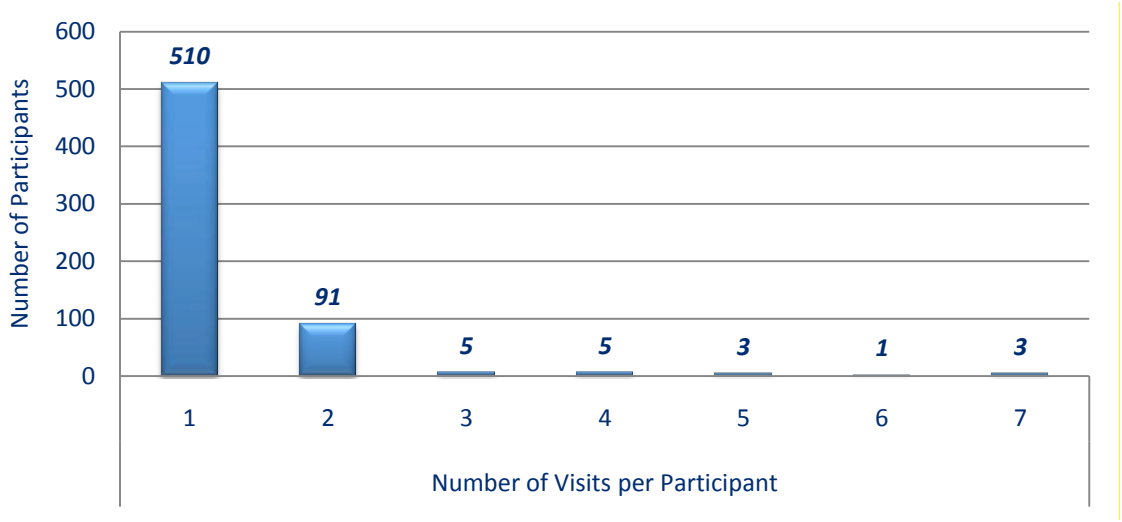
Other events included:

- 2 Advisory Board Meetings
- BioSongs Meeting

Participants came from colleges/ universities, government institutions, non-profit organizations, business organizations, and high schools (See Participant Diversity Report for complete demographic details).

Of the 618 participants, 108 visited NIMBioS more than once (Figure 1). Most participants making return visits to NIMBioS during RP 2 were participating in subsequent meetings of a Working Group; however, 49 participants took part in two different types of events (e.g. a Working Group and a Workshop), while five participated in three different types of events.

Figure 1. Number of events per participant



NIMBioS conducted evaluations of its Working Groups, Workshops, Tutorial, Undergraduate Conference at the Interface between Mathematics and Biology, and Research Experiences for Undergraduates/Veterinary Students programs. An evaluation of the pilot Teacher Collaboration program is ongoing as well. Evaluations were carried out via electronic surveys sent to all participants either after participation in a NIMBioS event, or both before and after participation if a pre/post comparison of responses was warranted. Evaluation findings, along with suggestions for improvement, were shared with event organizers, as well as NIMBioS staff as needed. Improvements to program content and format, as well as NIMBioS' overall operations, are made accordingly. Following is a brief synopsis of the evaluations of NIMBioS' major activities during RP 2.

Research Program Activities

Working Group and Investigative Workshop evaluation highlights are aggregated across all events in their respective categories. Evaluations of Working Groups and Workshops sought to answer the following common questions:

1. Were participants satisfied with the event overall?
2. Did the event meet participant expectations?

3. Do participants feel the group made adequate progress toward their stated goals?
4. Do participants feel they gained knowledge about the main issues related to the research problem?
5. Do participants feel they gained a better understanding of the research across disciplines related to the group's research problem?
6. What impact do participants feel participating in the event will have on their future research?
7. Were participants satisfied with the accommodations offered by NIMBioS?
8. What changes in accommodations, group format, and/or content would participants like to see at future meetings?

Working Groups

First Meetings

NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics. NIMBioS Working Groups are relatively small (10-15 participants), focus on a well-defined topic, and have well-defined goals and metrics of success. Working Groups typically meet 2-3 times over a two-year period, with each meeting lasting 3-5 days; however, the number of participants, number of meetings, and duration of each meeting is flexible, depending on the needs and goals of the group. During RP 2, NIMBioS hosted the first meetings of ten Working Groups, with a total of 130 participants (Table 1) (See http://www.nimbios.org/workinggroups/ for more details about specific Working Groups). Evaluation surveys were sent to all participants, with the exception of Working Group organizers and NIMBioS employees who were participating in the Working Groups. A total of 82 participants took part in the evaluation of the first meetings of their Working Groups.

Table 1. *Working Group First Meetings Hosted by NIMBioS*

Title of Working Group	Dates	# Participants
Coalitions and Alliances	4/16-18/09	10
Intragenomic Conflict	4/20-22/09	14
Feral Swine/Pseudo-rabies in Great Smoky Mountains National Park	4/27-29/09	13
Biological Problems Using Binary Matrices	5/ 26-29/09	10
Synthesizing and Predicting Infectious Disease while Accounting for Endogenous Risk (SPIDER)	6/7-9/09	14
Integrating Functional and Evolutionary Dynamics at Multiple Scales	6/10-12/09	10
Population and Community Ecology Consequences of Intraspecific Niche Variation	7/27-29/09	15
Darwinian Morphometrics: Cross-Topology Registration of Shape	1/10-12/10	16
Modeling Bovine Tuberculosis	2/17-18/10	14
Modeling Forest Insects	2/22-26/10	14

Synopsis of First Meeting Evaluation Results

- Overall satisfaction with first meetings was high among survey respondents, the majority of whom (97%) indicated they either agreed or strongly agreed that their respective meetings were very productive and met their expectations (95%).
- Almost all respondents (95%) thought the presentations were useful and the presenters were very knowledgeable about their topics (99%).
- The majority of respondents (83%) agreed that they had a better understanding of the main issues related to their group's research problem as a result of participation.
- A large majority (98%) said they planned to take the knowledge they gained during the Working Group and apply it to their own research.
- Forty-two percent of respondents reported they developed *unanticipate*d plans for collaborative research with other Working Group participants.
- Ninety-nine percent of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Working Groups to their colleagues.
- Almost all respondents said that the most useful aspect of their Working Groups was its multidisciplinary composition.

- Ninety-nine percent of respondents agreed that the format of their Working Group was very effective for achieving the group's goals.
- Ninety-two percent of respondents felt their Working Group made adequate progress toward its stated goals for the first meeting.
- Ninety-two percent of respondents said they left their respective meetings with a good idea of what their contribution will be at the next meeting.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

Second Meetings

During the reporting period, NIMBioS hosted the second meetings of five Working Groups, with a total of 53 participants (Table 2). Evaluation surveys were sent to all participants, with the exception of Working Group organizers and NIMBioS employees who were participating in the Working Groups. A total of 29 participants took part in the evaluation of the second meetings of their Working Groups.

Table 2. *Working Group Second Meetings Hosted by NIMBioS*

Title of Working Group	Dates	# Participants
Synthesizing and Predicting Infectious Disease while Accounting for Endogenous Risk (SPIDER)	11/9-11/09	11
Biological Problems Using Binary Matrices	12/10-13/09	11
Feral Swine/Pseudo-rabies in Great Smoky Mountains National Park	1/25-26-10	14
Coalitions and Alliances	2/4-6/10	9
Integrating Functional and Evolutionary Dynamics at Multiple Scales	3/1-3/10	8

Synopsis of Second Meeting Evaluation Results

- Overall satisfaction with the Working Group meetings was high among survey respondents, 97% of whom indicated they either agreed or strongly agreed that their meeting was very productive, while 93% indicated it met their expectations.
- One-hundred percent of respondents thought the presentations were useful and that the presenters were very knowledgeable about their presentation topics.
- Ninety-seven of respondents agreed that participating in the meeting increased their understanding of the work being done in by others in the group, while 83% agreed that it

increased their understanding of how everyone's work would come together to achieve the goals of the group.

- Many (79%) of respondents said that participating in the Working Group had influenced their research agendas. Several participants noted that the group had lead to collaborations that otherwise may not have occurred.
- Most respondents (86%) agreed that the format of the Working Group was very effective for achieving its goals.
- Almost all respondents (97%) felt that their Working Group made adequate progress toward reaching its intended goals.
- Most (86%) respondents said they left the second meeting with a good idea of what their contribution would be at the next meeting.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

Workshops

NIMBioS Investigative Workshops involve 30-40 participants, focus on a broad topic or a set of related topics, attempt to summarize/synthesize the state of the art and identify future directions, and have potential for leading to one or more future Working Groups. NIMBioS hosted four Investigative Workshops during RP 2, with a total of 149 participants (Table 3). Evaluation surveys were sent to all participants, with the exception of Workshop organizers and NIMBioS employees who were participating in the Workshops. A total of 124 participants took part in the evaluation of the Workshops.

Table 3. *Investigative Workshops Hosted at NIMBioS*

Title of Workshop	Dates	# Participants
Modeling White Nose Syndrome (WNS) in Bats at the Individual, Colony and Regional Levels: Epizootiology and Management	6/29-7/1/09	35
Modeling Bovine Tuberculosis	7/7-9/09	38
New Soil Black Box Strategies	10/15-17/09	33
Optimal Control and Optimization for Individual-based and Agent-based Models	12/1-3/09	43

Synopsis of Workshop Evaluation Results

- Overall satisfaction was high among survey respondents, the majority of whom (93%) indicated they either agreed or strongly agreed that their Workshop was very productive. Most (89%) also agreed it met their expectations.
- Almost all respondents thought the presentations were useful (98%) and that the presenters were very knowledgeable about their topics (92%).
- Ninety-eight percent of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Workshops to their colleagues.
- Most respondents (94%) felt that participating in their Workshops helped them to better understand the research going on in other disciplines regarding the research problems.
- Most (86%) said the exchange of ideas that took place during the Workshop would influence their future research.
- The majority of respondents agreed that they had a better understanding of the main issues related to their Workshop's research problem as a result of participation.
- Ninety-five percent of respondents agreed that the format of their Workshop was very effective for achieving its goals.
- Ninety percent of respondents felt the participants of their Workshops, overall, made adequate progress toward the Workshop's stated goals.
- A large majority (97%) said they were satisfied with the opportunities provided during the Workshop presentations and discussions to ask questions and/or make comments.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

Education and Outreach Program Activities

Tutorial: Optimal Control and Optimization for Individual-based and Agent-based Models

NIMBioS hosted one Tutorial during RP 2. The Optimal Control and Optimization for Biologists Tutorial was conducted at NIMBioS December 1-3, 2009. The Tutorial comprised 37 participants, including co-organizers Suzanne Lenhart (University of Tennessee, Department of Mathematics and NIMBioS Associate Director for Education, Outreach and Diversity) and Michael Bevers (USDA Forest Service, Fort Collins, Colorado). Participants included a diverse collection agricultural scientists, biologists, engineers, and mathematicians.

The Tutorial was designed to introduce selected topics in optimal control and optimization with an emphasis on biological applications. Introductory material on optimal control of ordinary differential equations and difference equations, and some interactive computer labs were included in sessions led by Dr. Lenhart. Mathematical programming and spatial optimization techniques were demonstrated for managing natural resources under conditions of risk. Lectures and computer lab exercises, led by Dr. Bevers, introduced linear, integer, nonlinear, stochastic and chance-constrained programming methods. Renee Fister of Murray State University gave a lecture on optimal control techniques applied to cancer modeling. Paul Armsworth of the University of Tennessee lectured on applications in conservation and natural resource management.

Evaluation surveys were sent to all participants, with the exception of Tutorial organizers and NIMBioS employees who were participating in the Tutorial. A total of 26 participants took part in the evaluation of the Tutorial.

The evaluation of the Tutorial sought to answer the following questions:

1. Were participants satisfied with the Tutorial overall?
2. Did the Tutorial meet participant expectations?
3. Was the Tutorial appropriate to the participants' levels of expertise?
4. Did participants feel they learned an appropriate amount of information?
5. How did participants feel about the amount of content and format of the Tutorial?
6. Were participants satisfied with the accommodations offered by NIMBioS?
7. What changes in accommodations, group format, and/or content would participants like to see at future similar meetings?

Synopsis of Tutorial Evaluation Results

- One-hundred percent of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS Tutorials to their colleagues.
- Almost all respondents agreed the Tutorial met their expectations (96%) and was appropriate to their level of expertise (92%).
- All respondents thought the instructors were knowledgeable about their topics, and 92% thought the presentations were useful.
- The majority of participants thought the hands-on exercises were useful (96%), while a smaller majority felt the group discussions were useful (89%).

- Ninety-two percent of respondents agreed that the format of the Tutorial was very effective for achieving its goals.
- The majority of respondents (69%) indicated they felt the amount of content offered during the Tutorial was "just right," while 31% felt there was too much material presented for the allotted time.
- One-hundred percent of participants agreed that they had a better understanding of optimal control of ordinary differential equations and difference equations as a result of attending the Tutorial.
- A smaller majority of participants (58%) agreed that they had a better understanding of linear, integer, nonlinear, stochastic and chance-constrained programming methods as a result of attending the Tutorial.
- A large majority (92%) said they were satisfied with the opportunities provided during the Tutorial to ask questions and/or make comments.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

Research Experiences for Undergraduates/Veterinary Students

The NIMBioS *Research Experience for Undergraduates* (REU) and *Research Experience for Veterinary Students* (REV) programs took place simultaneously on the UT campus June 1-July 24, 2009. During the program, veterinary students and undergraduate students majoring in math, biology, and related fields lived on campus and worked in four-person research teams mentored by UT professors. The teams worked on state-of-the-art research projects at the interface of math and biology both in the lab and in the field. Participants learned how to write computer programs to model their research findings mathematically. Besides the research projects, program activities included lectures on modeling and background on the projects, lab work, tutorials on Matlab and R, an ethics session, a career advice session, progress and finale presentations, a written report, and social activities. The program was designed to give participants the opportunity to actively participate in the various components of the scientific research process. Each project group had a math/computational mentor and a biology/vet mentor.

The REU/REV program comprised 16 participants who came from a diverse array of backgrounds, including agricultural sciences/natural resources, biological/biomedical sciences, engineering, veterinary medicine, and mathematics. A high school math teacher and biology teacher were also included in the

16. Four veterinary students and four undergraduate math majors participated in the REV program projects, while the remaining six undergraduates and two teachers participated in the REU program projects.

Evaluation surveys were sent to all student and high school teacher participants in the program. All 16 participants took part in the evaluation.

The evaluation of the REU/REV sought to answer the following questions:

1. Were participants satisfied with the program overall?
2. Did the research experience meet participant expectations?
3. Did the research experience impact participant plans to go to graduate school?
4. To what extent did participants increase their research skills during the program?
5. To what extent do participants feel they gained knowledge about the research process?
6. How satisfied were participants with their mentors?
7. How satisfied were participants with the accommodations offered by NIMBioS?
8. What changes do participants feel NIMBioS should make in the program for next year?

Synopsis of REU/REV Evaluation Results

- Overall satisfaction with the program was high among participants, 100% of whom said they were “satisfied” or “very satisfied” with their experience and would recommend the program to others.
- Fourteen of the sixteen participants said most or all of their expectations were met or exceeded during the program.
- Participants rated their mentors highly, with the average biology mentor rating at 4.8 and the average math mentor rating at 4.3 (on a scale of 1-5, with 5 being the most favorable).
- Participants reported gains in several research-related skills, with an average rating of 3.4 for all skill levels on the pre survey and 3.9 on the post survey (on a scale of 1 = extremely poor at the skill and 5 = excellent at the skill).
- Participants reported gains in knowledge regarding several research related topics. Before the program, participants on average rated themselves 3.2 on a 5-point scale (1 = extremely poor understanding of the topic, 5 = excellent understanding). After participation, the average rating was 4.0.

- While most participants' plans to go to graduate school remained unchanged as a result of participating in the program, one student said the experience encouraged him/her to attain a doctoral degree when he/she previously planned to attain only a bachelor's degree.
- Overall, respondents reported being satisfied with the travel, housing, and other amenities provided by NIMBioS.

Undergraduate Conference on the Interface between Mathematics and Biology

The NIMBioS first annual Undergraduate Research Conference at the Interface Between Biology and Mathematics took place at the University of Tennessee's Conference Center in downtown Knoxville October 23-24, 2009. The event was organized by the NIMBioS Education and Outreach Associate Director for Education, Outreach, and Diversity, Suzanne Lenhart, and the Education and Outreach Coordinator Sarah Duncan.

The conference comprised nearly 200 participants, including college/university undergraduates, college/university faculty and staff, government employees, graduate students, and postdoctoral researchers. Undergraduates in biology, mathematics, computer science and related fields gave talks and presented posters on topics ranging from modeling diseases to using mathematics to understand population dynamics and biological phenomena. The conference featured 40 student talks and 40 student posters.

Keynote speakers at the conference included Lisa J. Fauci, professor of mathematics at Tulane University, who discussed the dynamics of cilia and flagella, and Paul E. Super, Science Coordinator at the Great Smoky Mountains National Park (GSMNP), who talked about research, inventories, and monitoring used in protection efforts at GSMNP. The conference also included a panel discussion with university faculty on career opportunities at the interface of mathematics and biology.

The evaluations for the conference sought to answer the following questions:

1. Were participants satisfied with the conference overall?
2. Did the conference meet participant expectations?
3. Do participants feel the conference allowed them to make new connections with others in math and biology?
4. Do participants feel they gained a better understanding of undergraduate research happening at the interface of mathematics and biology?

5. What impact do undergraduate participants feel the conference will have on their future career plans?
6. Were participants satisfied with the accommodations offered by NIMBioS?
7. What changes in accommodations, group format, and/or content would participants like to see at future similar meetings?

Synopsis of UBM Conference Evaluation Results

- Overall satisfaction with the conference was high among respondents, the majority of whom indicated they either agreed or strongly agreed that the conference was productive (86%) and met their expectations (88%).
- Most respondents thought the presentations were useful (87%), while a smaller majority felt the panel discussion was useful (73%).
- Ninety-one percent of respondents either agreed or strongly agreed that they would recommend participating in NIMBioS conferences to their colleagues.
- Overall, respondents reported being satisfied with the conference accommodations provided by NIMBioS.
- Respondents reported relatively high levels of learning on how to present scientific research. Learning gains, however, were slightly lower regarding career opportunities at the interface of mathematics and biology.
- Most respondents felt the most useful aspect of the conference was the student presentations followed by the good atmosphere for student interaction and the career panel.
- Ninety-five percent of undergraduate respondents said they felt that participating in the conference helped them become more knowledgeable about undergraduate research going on at the interface of biology and math.
- Ninety-two percent of respondents felt the conference format was effective.
- The majority of respondents (97%) agreed that the conference made adequate progress toward its goal of creating a forum through which undergraduates could present research and make new connections at the interface of math and biology.
- Eighty-one percent of undergraduate respondents said they felt that the exchange of ideas that took place during the conference would (or potentially would) influence their career plans.
- The majority of respondents (86%) said they felt that participating in the conference helped them make connections with others within the interdisciplinary field of math and biology.

Participant Diversity Report

Year Two

April 1, 2009-March 31, 2010

National Institute for Mathematical and Biological Synthesis
March, 2010

NIMBioS Participant Diversity Report, Year Two

Introduction

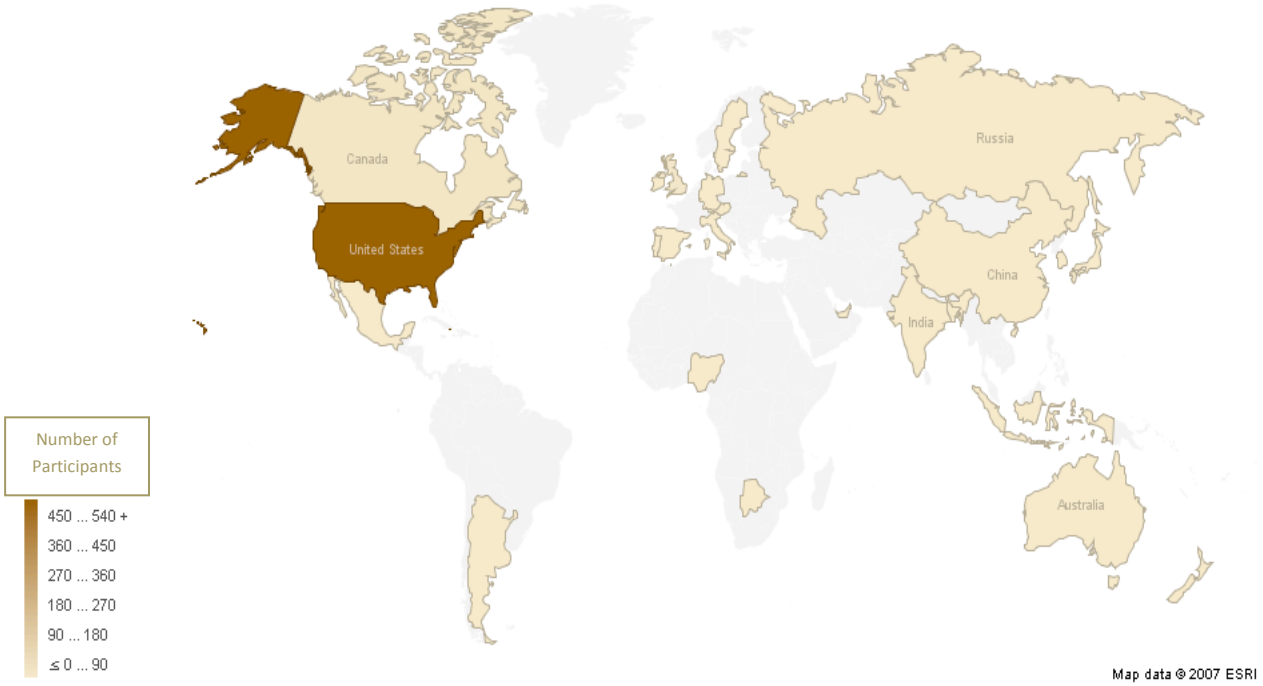
This is a report of the diversity represented by NIMBioS' participants during its second annual reporting period (RP 2) to the National Science Foundation. The report covers the period of April 1, 2009-March 31, 2010. An electronic demographics survey aligned to the reporting requirements of the National Science Foundation was sent to all participants before their arrival at NIMBioS. A link to the survey was sent to each of the 618 participants during RP 2 three weeks before the date of his or her event. Reminder emails were sent to non-responding participants at one and two weeks beyond the initial contact date. The overall response rate for the demographic survey during RP 2 was 77%. Demographic questions regarding gender, race, ethnicity, and disability status were optional. When feasible, the Evaluation Coordinator supplied missing demographic data from other sources (e.g. institution, primary field of study). The evaluator did not assume race, ethnicity, or disability status for any participant who did not report this information. All demographic information is confidential, and results are reported only in the aggregate.

Participant Demographics

Geographic Diversity

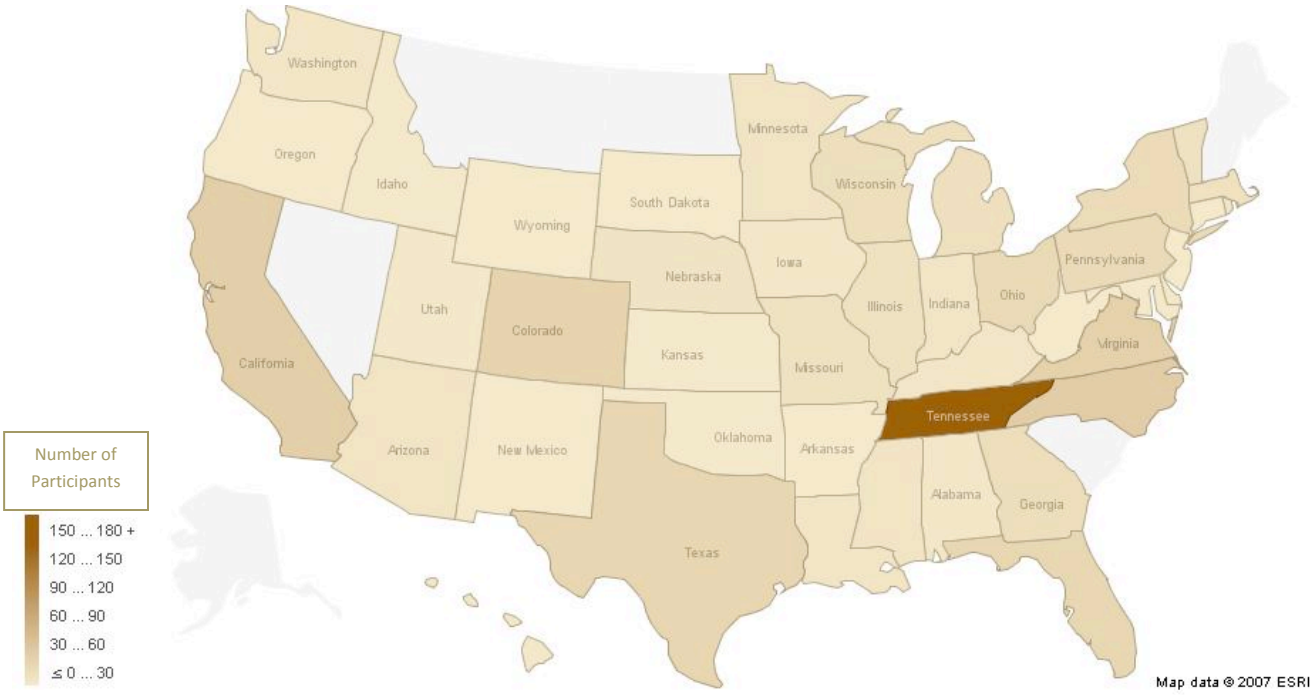
During RP 2, a total of 618 people from 25 countries participated in NIMBioS events (109 of these people visited NIMBioS more than once during the reporting period). Most participants came from the United States (90.5%), Canada (3.4%), and the United Kingdom (1.8%) (Figure 1).

Figure 1. NIMBioS RP 2 Participants by Country



Within the U.S., 43 different states were represented, as well as Puerto Rico. While the greatest number of participants came from within Tennessee (151), several other states were represented by relatively large numbers of participants, including North Carolina (34), California (33),Virginia (30), and Colorado (28) (Figure 2).

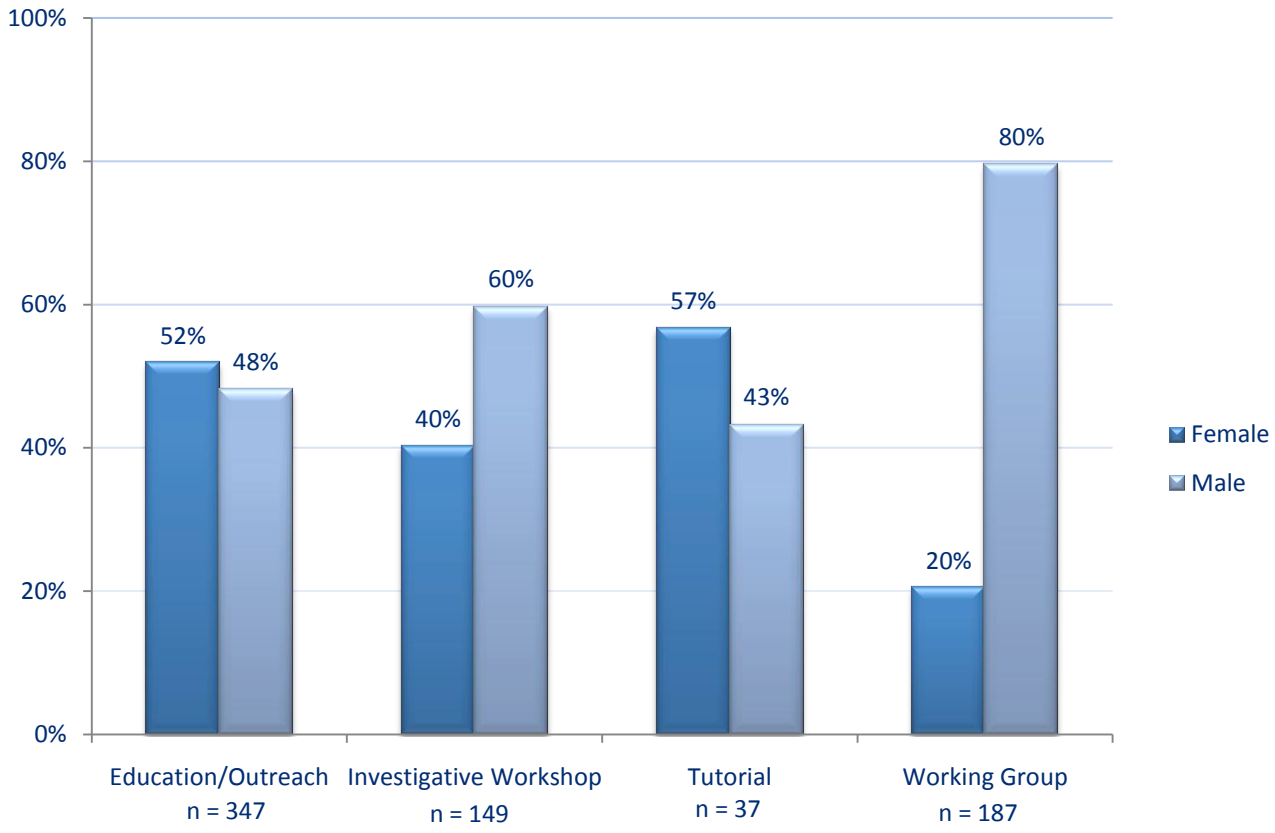
Figure 2. NIMBioS RP 2 Participants by U.S. State



Gender, Racial, and Ethnic Diversity

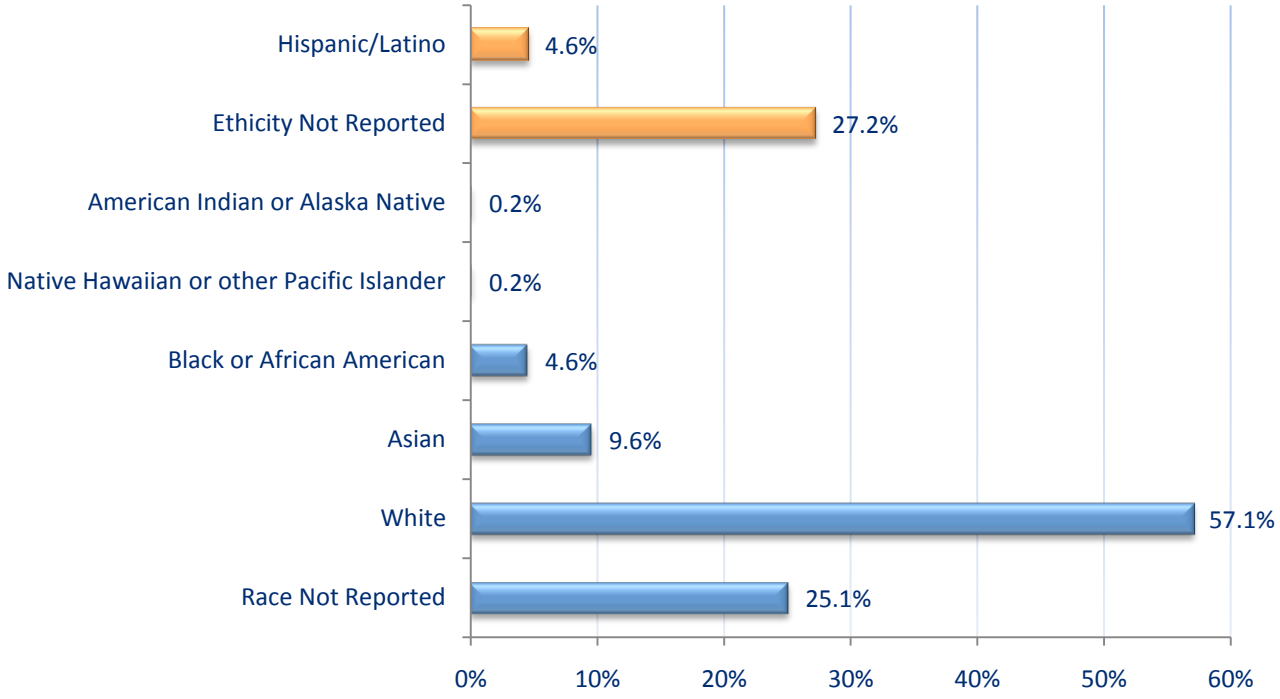
Across all 33 events during RP 2, the ratio of gender was 57% male to 43% female. Within specific activity types, this gender ratio varied. (Note: Although tutorials are considered part of the Education and Outreach (EO) Program at NIMBioS, the NIMBioS leadership team is interested in analyzing the gender, ethnic, and racial composition of these events separately from the rest of the EO activities.) While EO activities and the Tutorial have a similar gender ratio, relatively fewer women have participated in Investigative Workshops. Working Groups show a larger imbalance with regard to gender, with 80% of participants being male (Figure 3).

Figure 3. Gender composition of participants by event type



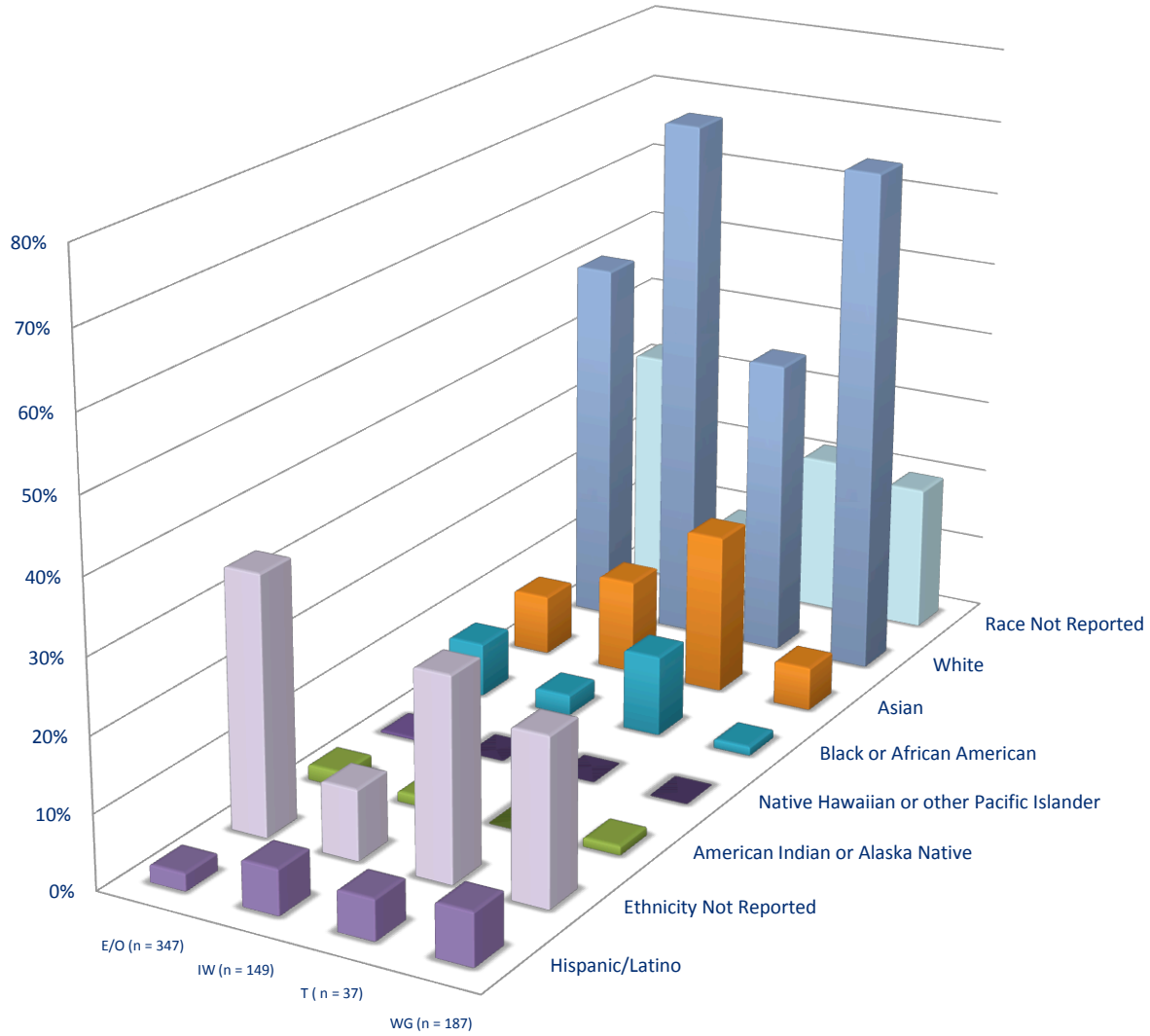
Of the 447 participants who opted to report their ethnicity status, 4.6% indicated they were Hispanic/Latino. Of the 459 who reported their racial status, the majority (57.1%) indicated they were white; however, Asian, black or African American, native Hawaiian/Pacific islander, and Native American races were also represented (Figure 4).

Figure 4. Ethnic and racial composition of participants (n = 618)



By event, Working Groups showed the greatest percentage of Hispanic/Latino participants (7%), followed by Investigative Workshops (6%). Among the different event types, participants self-identifying racially as white were always in the majority, followed by Asian and Black or African American (Figure 5).

Figure 5. Ethnic and racial composition of participants, by event type



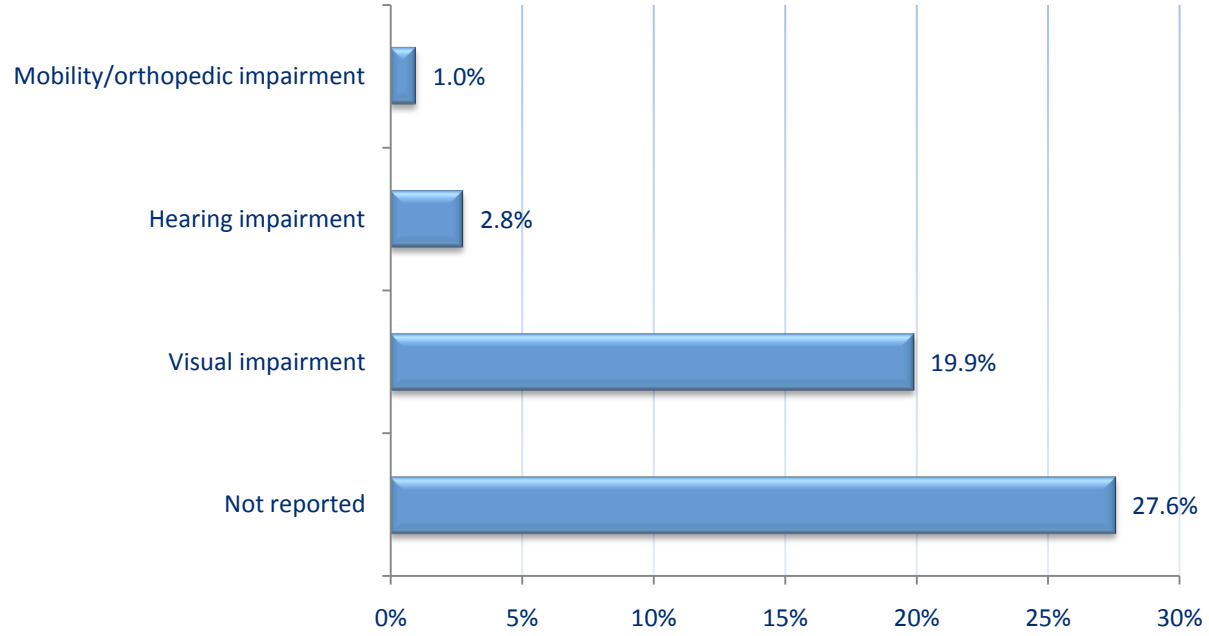
	E/O (n = 347)	IW (n = 149)	T (n = 37)	WG (n = 187)
Hispanic/Latino	2.3%	6.0%	5.4%	7.0%
Ethnicity Not Reported	34.6%	9.4%	27.0%	22.2%
American Indian or Alaska Native	2.0%	1.3%	0.0%	1.2%
Native Hawaiian or other Pacific Islander	0.3%	0.0%	0.0%	0.0%
Black or African American	7.2%	2.7%	10.8%	1.2%
Asian	8.1%	12.8%	21.6%	5.8%
White	49.9%	71.8%	40.5%	69.0%
Race Not Reported	32.3%	9.4%	21.6%	19.9%

E/O = Education and Outreach Activities
IW = Investigative Workshops
T = Tutorial
WG = Working Groups

Disability Status

Of the 444 participants indicating disability status, nearly 20% indicated having some sort of visual impairment, while nearly 3% indicated having a hearing impairment. A smaller percentage indicated having mobility impairment (Figure 6).

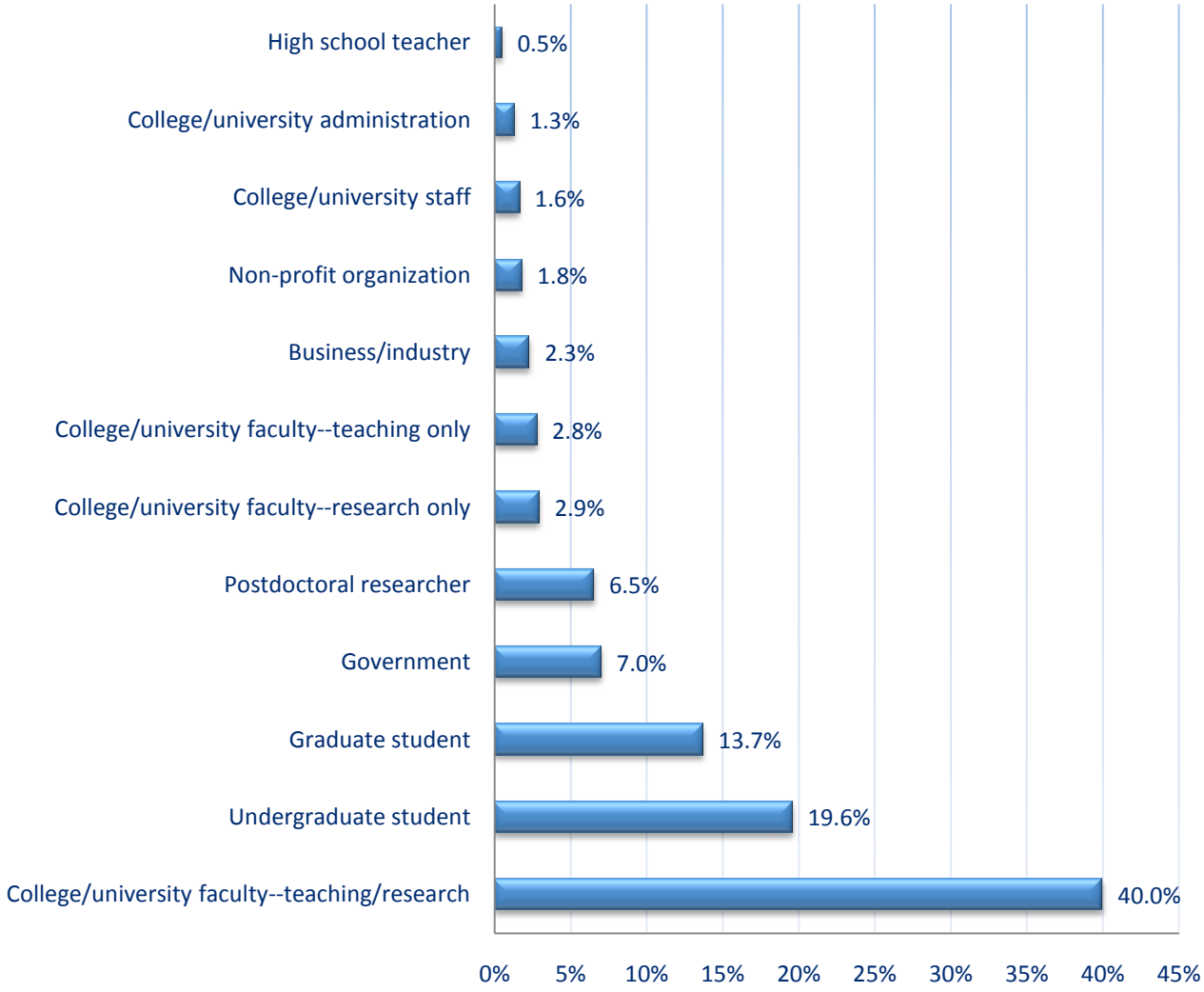
Figure 6. Disability status of participants (n = 618)



Institutional and Disciplinary Diversity

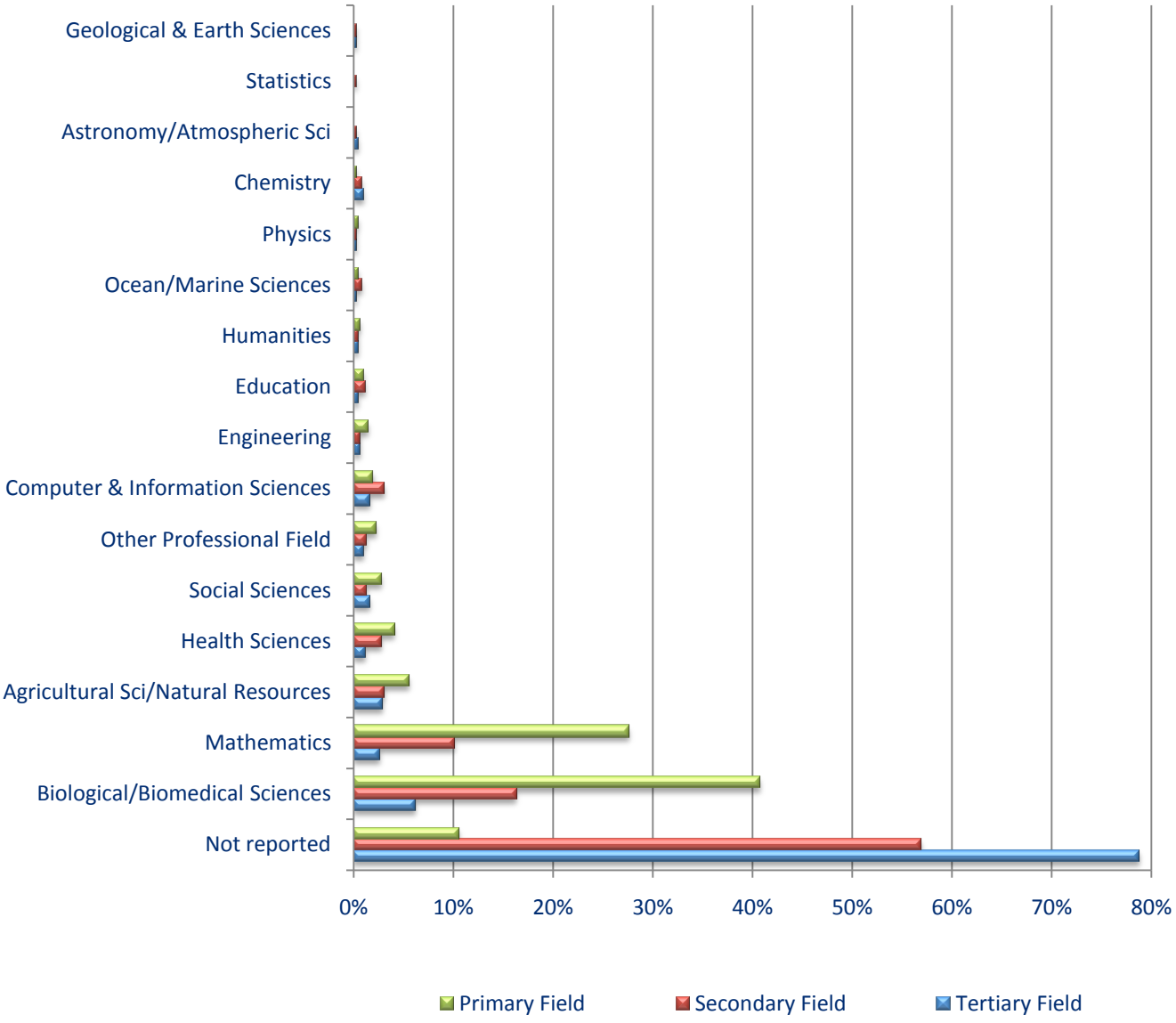
The majority of NIMBioS participants were college/university faculty or staff, undergraduate, or graduate students; however, many participants came from government, business/industry, non-profit, or other positions (Figure 7).

Figure 7. Status of participants (n = 618)



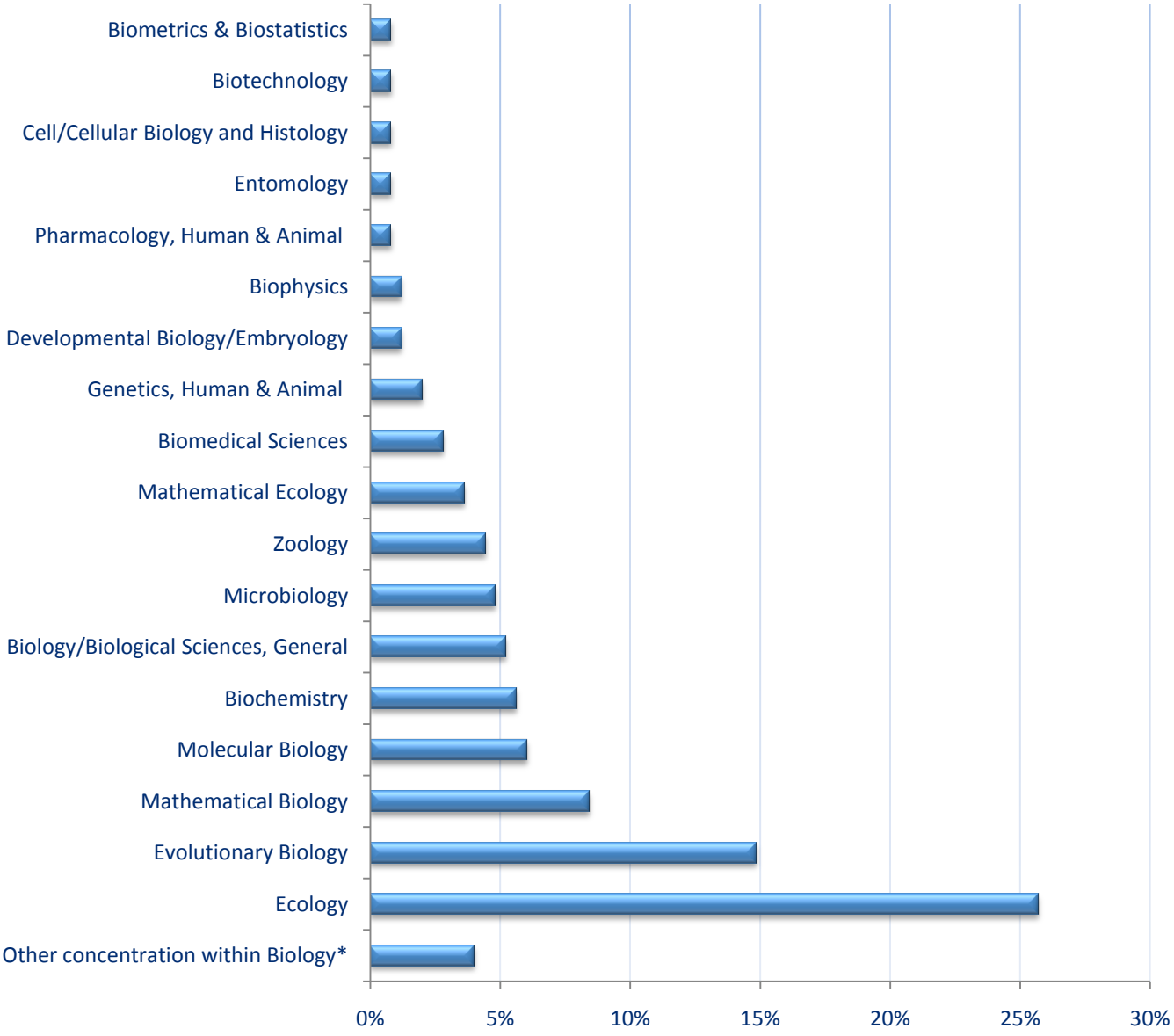
Participants at NIMBioS indicated primary, secondary, and tertiary fields of study, as well as areas of concentration within those fields. The most commonly reported fields of study included biological/biomedical sciences, mathematics, and agricultural sciences/natural resources, although many other disciplines were represented (Figure 8).

Figure 8. Primary, secondary, and tertiary discipline areas of participants (n = 618)



The 249 participants naming Biological/Biomedical Sciences as their primary field of study indicated 27 different areas of concentration within which they would classify their primary areas of research/expertise. The most commonly indicated area of concentration was ecology (26%), followed by evolutionary biology (15%) and mathematical biology (8%) (Figure 9).

Figure 9. Participant research/expertise area concentrations within biological/biomedical sciences field of study (n = 249)



* Other concentrations having only one participant: Wildlife/Range management, Veterinary Medicine, Plant pathology/phytopathology, Physiology, Human & Animal, Pathology, Human & Animal, Neuroscience, Immunology, Endocrinology, Botany/Plant Biology

Participants during RP 2 represented 249 different institutions, including colleges and universities, government institutions, private businesses, non-profits, and high schools (Figure 10). Of the 207 *different* colleges/universities represented, most were classified as comprehensive (having undergraduate and graduate programs) (Figure 11).

Figure 10. Types of institutions represented

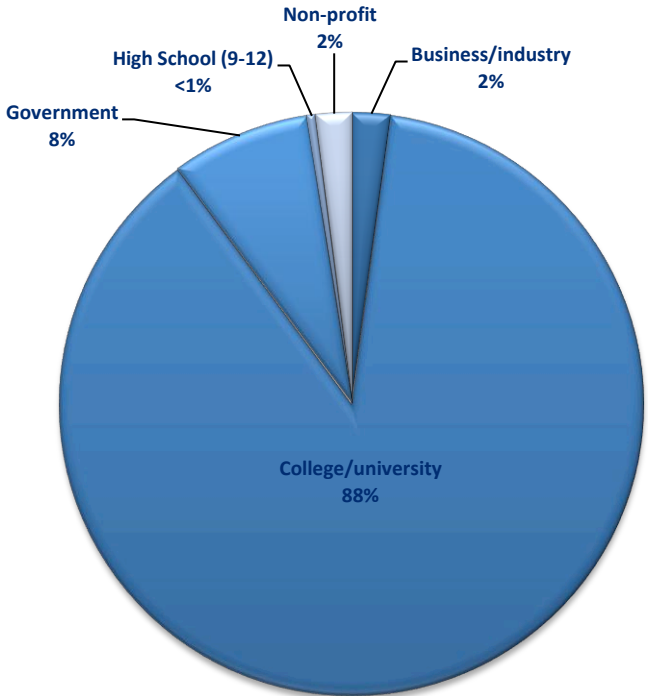


Figure 11. Characteristics of participants' colleges/universities