NIMBioS

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National Institute for Mathematical and Biological Synthesis

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Accomplishments

* What are the major goals of the project?

A major goal of mathematical models and analysis in biology is to provide insight into the complexities arising from the non-linearity and hierarchical nature of biological systems. The primary goals of NIMBioS are to foster the maturation of cross-disciplinary approaches in mathematical biology and foster the development of a cadre of researchers who are capable of conceiving and engaging in creative and collaborative connections across disciplines to address fundamental and applied biological questions. NIMBioS has been developed to efficiently utilize NSF funding: 1) to address key biological questions by facilitating the assembly and productive collaboration of interdisciplinary teams; and 2) to foster development of the critical and essential human capacity to deal with the complexities of the multi-scale systems that characterize modern biology.

Our proposed effort includes a variety of routes to achieve the above goals, based upon the successes of our leadership team in developing new interdisciplinary collaborations nationally and internationally, and on the successful efforts at other Centers. A major component of our efforts is to encourage the development of small Working Groups on emphasis areas at several levels of biological organization that will benefit from interdisciplinary efforts. Working groups arise from community requests for NIMBioS support, and are vetted by our external Advisory Board. A second component to meet our goals is through encouraging community requests for Investigative Workshops. These assemble larger groups of researchers to assess somewhat broader problems, with dual goals of fostering language-building across disciplines and defining specific issues to be addressed by future Working Groups.

Human capacity building goals are fostered through: direct mentoring of new researchers (including undergraduate and graduate students and post-doctoral fellows); outreach efforts in collaboration with diverse professional organizations to educate biologists about mathematical and computational approaches found to be broadly useful in biological applications; connections to institutions serving under-represented groups; a 'research experience for undergraduates' program; and varying levels of tutorials designed to enlighten biologists about key quantitative methods, with particular emphasis on the application of high performance computing methods to analyze biological problems which involve large data sets, spatial information, and dynamics. A further objective is to assist mathematicians in identifying new mathematical challenges arising from current biological research.

The nature of the questions addressed by NIMBioS spans all of biology, thus impacting both basic and applied science. The impacts will necessarily be broad, ranging from specific models and applications to fundamental questions about human origins, biosphere functioning, and the emergence of biological patterns at diverse scales. An objective is for NIMBioS to provide the effective infrastructure so that it becomes a primary location for the careful analysis of numerous questions of direct public policy concern, with particular emphasis on issues arising from infectious disease of zoonotic origin. To carry out research and address the challenging nature of modern biology, NIMBioS fosters the continuing development of individuals trained at this interface of biology and mathematics as well as the development of entire programs that are equipped to educate the array of mathematically competent, biologically knowledgeable and computationally adept researchers needed to address the vast array of challenging questions in this century of biology. Fostering high quality interdisciplinary programs, including a diverse representation of individuals involved in life science and mathematical research, is a major emphasis of NIMBioS.

* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities:

Over the reporting period from September 1, 2012 through August 31, 2013, NIMBioS hosted 19 meetings of 15 different Working Groups (two joint working groups held two additional meetings offsite), 2 Investigative Workshops, 3 Tutorials, an Undergraduate Research Conference, a Research Experience for Undergraduates program, and a Summer Graduate School Workshop. There were a total of 695 participants in NIMBioS-hosted activities during this period with 19 Postdoctoral Fellows in residence, 3 Sabbatical Fellows and 39 Short-term Visitors.

The Working Groups which met during this period were: Ocean Viral Dynamics (October 2012, June 2013), Suction Feeding Biomechanics (October 2012, May 2013), Play, Evolution, and Sociality (October 2012), Modeling Anthrax Exposure (November 2012, May 2013), Gene Tree/Species Tree Reconciliation (November 2012), Optimal control for Agent-Based Models (November 2012), Food Web Dynamics (December 2012), Multiscale Modeling of the Life Cycle of Toxoplasma gondii (December 2012, July 2013), 'Pretty Darn Good' Control: Extensions of Optimal Control for Ecological Systems (January 2013), Biotic Interactions (February 2013), Within-host modeling of Mycobacterium avium subsp. paratuberculosis Infections (March 2013), Hierarchy and Leadership (April 2013), Cross-topology Registration (May 2013), Design and Analysis of Bat Population Monitoring (joint with USFWS, February 2013 at USGS-Fort Collins Science Center, May 2013 at NIMBioS), Nonautonomous Systems and Terrestrial C-cycle (May 2013), and Integrating Human Risk Perception of Global Climate Change into Dynamic Earth System Models (June 2013, a joint activity with SESYNC, held at SESYNC).

The Investigative Workshops were: Systems and Synthetic Microbiology (March 2013), and Modeling Blood Cell Interactions (June 2013).

The Tutorials were: Using Bioinformatics Data and Tools to Engage Students in Problem Solving: A Curriculum Development Workshop (January 2013; cosponsored with SCALE-IT), Mathematical Modeling for the Cell Biology Researcher and Educator (April 2013), and Introduction to Population Wildlife Disease Modeling (July 2013). The Summer Graduate Workshop was on the topic Connecting Biological Data with Mathematical Models.

Ongoing during this period were efforts in collaboration with the NSF-funded XSEDE Remote Data and Visualization project to develop new high performance computing tools, particularly using the R-langauge, to encourage broader use of computational methods in a variety of biological areas.

Demographics data on all participants at events from September 1, 2012 through May 31, 2013 are presented in detail in the NIMBioS Evaluation Report (see section

Y5-2 of the attached addendum to this Annual Report). There were 545 participants through May 31, 2013 from 23 countries and 41 U.S. states as well as the District of Columbia and Puerto Rico representing 204 different institutions. International participants amounted to 14% of all participants. Most participants were college or university faculty (51%), but undergraduates (16%), post-doctoral researchers (14%), and graduate students (6%) accounted for a significant number. Across all events the gender ratio was 61% male to 39% female, and minority representation was near 11%. Representation of various minority categories was on par with current trends in minority representation for doctoral recipients in the biological sciences, and greater than that in the mathematical sciences.

Short-term Visitors were from 37 different institutions and collaborated with NIMBioS post-doctoral and sabbatical fellows, faculty from six University of Tennessee departments, and 16 researchers external to NIMBioS/Univ. Tennessee.

Specific Objectives: A goal of NIMBioS is to encourage research activities at the interface of mathematics and biology by encouraging requests from the broad community for activities to be held at NIMBioS. These activities are evaluated by the external Advisory Board. The Board met once physically and twice virtually during this reporting period and evaluated sixteen requests for Working Groups and Investigative Workshops, of which nine have been supported. The Board also evaluated fifty requests for postdoctoral fellowships of which seven were supported, and the Board recommended support for four Sabbatical Fellow requests.

One specific objective, supported by a supplement to the main award, involves a collaboration with the Remote Data and Visualization project of NSF-XSEDE. This includes ongoing efforts to extract biologically meaningful information from genomic sequence data. This includes developing a statistical and computational framework, using parallel methods linking C codes to statistical tools in R, to fit mechanistic models to genomic sequence data using likelihood functions derived from population genetics. This has provided 200 time speed-ups and has been applied to predicting protein production rates of genes based upon the evolutionary patterns in their usage of codons. RDAV's developers of the pbdR parallel framework within R (see r-pbd.org) prepared a tutorial on parallel computing in R, which has many components useful for the analysis of biological and ecological data. An effort is underway to modify the tutorial with examples using data from biology and ecology.

Another specific objective of NIMBioS is to foster the development of a cadre of scholars who are able to effectively carry out research at the interface of mathematics and biology. NIMBioS supported activities using several different methods in order to meet this objective for individuals at diverse levels of experience.

NIMBioS supported an array of outreach activities for the general public, K-12 students and teachers that illustrated, including in a hands-on manner, the connections between math and biology. As one example, NIMBioS hosted 50 students from Gresham Middle School, along with teachers and parent chaperones. In one activity, students learned how computer code can help analyze images for biological applications. For the image lab, students explored how one could use the software to find the basal area of leaves. The students changed parameters for the program in Matlab to improve detection and imported images of leaves taken with webcams. The students also explored the properties of platonic solids and how they relate to the structure of viruses. Students built solids from plastic triangles and made their own origami solids to take home. Another group of 150 4-6th grade students investigated how one can use an Earth beach ball to estimate the area of forest on the Earth's surface. They also learned about careers in science from NIMBioS

researchers. In collaboration with 4-H and the NSF-funded Engineering Research Center CURENT, NIMBioS hosted a group of middle-school girls for a day of activities, including the opportunity to learn about the parts of a cell, use software to design their own shapes for this and then print the shapes they designed on a 3-d printer.

At other levels of experience, NIMBioS hosted a Research Experience for Undergraduates program which included undergraduates in math and biology fields from 17 different institutions, carrying out team research projects on six different topics including mathematical modeling of fetal electrocardiograms, modeling animal disease from coronavirus, automatic detection of rare birds from audio recordings, modeling the environmental transmission of infectious diseases: Escherichia coli transmission in cattle, modeling protein translation and genome evolution and modeling animal social network dynamics. NIMBioS hosted an undergraduate research conference at the interface of math and biology, which included 36 posters and 23 talks and was attended by more than 100 students from more than 30 institutions.

Graduate students have been regular participants in many NIMBioS research activities, and NIMBioS hosted, jointly with the Mathematical Biosciences Institute and the Centre for Applied Mathematics in Bioscience and Medicine, a Summer Research Workshop on Connecting Biological Data with Mathematical Models, which brought 39 graduate students from more than 25 different institutions to Knoxville to collaborate in teams on projects developed by a distinguished group of instructors from eight different institutions. NIMBioS also supported six UT graduate students to carry out research in collaboration with NIMBioS postdocs and researchers, and provided support for graduate students for short-term visits.

Postdoctoral Fellows at NIMBioS are independent researchers who develop their own proposed research activity, and receive mentoring from both a mathematics and a biological sciences faculty member. Of the 19 Postdoctoral Fellows in residence during this reporting period, six had completed Ph.D.s in mathematical sciences and thirteen had backgrounds in areas of biology. An objective of NIMBioS is to enhance career opportunities for current and former Postdoctoral Fellows. During this reporting period, five past or current Fellows accepted new faculty positions, and two accepted research positions with federal agencies.

Significant Results: NIMBioS relies upon participants to self-report products that were derived from their participation in NIMBioS activities. There were a total of 522 products reported from September 1, 2012 through May 31, 2013, including 130 journal articles, 1 book and 12 book chapters, 1 published conference proceeding, 17 dissertations and theses, and 6 other one-time publications. A total of 9 websites and other web-related utilities were reported, 33 video and audio products, 2 software or netware products, 1 model, 1 database, and 17 educational aids or curricula, along with 1 unclassified product (Golf Course Habitat Improvement for Bat Conservation project). Also, during this period a total of 249 presentations, 23 grant requests, and 19 meetings, workshops or symposiums were reported. Details on publications in journals, books, and conference proceedings are included in the Products section; details on presentations and other products are in the Addenda to this annual report.

NIMBioS-supported activities have resulted in publications in a broad range of topics. Quantitative Methods and Population and Evolutionary Processes are the most frequent subject areas, but Epidemiology and Ecosystem Science are common subjects along with Ecological Biology and Physiology and Immunology. Figure 34 in the NIMBioS Evaluation Report (provided in section Y5-2 of the addendum to this

annual report) and Figure 1 (provided as an attached supporting file to this section) illustrate the diversity of scientific topics covered by NIMBioS-supported activities using the data on the frequencies at which different subject areas were represented in related journal articles.

A number of the publications resulting from NIMBioS activities appeared in top national and international journals with high impact factors, including Nature, Science, Ecology Letters, Trends in Ecology and Evolution, and the Proceedings of the National Academy of Sciences. Table 1 in the supporting file included with this section provides details on NIMBioS-derived publications in certain high-impact journals.

Key outcomes or Other achievements:

Metrics of success for NIMBioS include establishing new connections between researchers from diverse backgrounds leading to new interdisciplinary science. An illustration of the outcomes NIMBioS has in this regard appears in Figure 2 (attached as a supporting file for this section), which shows the fields of expertise of participants in NIMBioS Working Groups and the connections fostered between individuals with different backgrounds by participation in Working Groups. The nodes on the graphic correspond to the participant's major field of expertise, with the node size being a non-linearly scaled metric for the number of participants in that field. While the majority of participants identify themselves as being in fields of mathematical sciences or biological/biomedical sciences, there are a large number of participants from engineering, social science, agricultural science, ocean/marine science, physics, geology/earth science, computer/information science and health science, along with smaller representation from humanities and psychology. As the width of the connecting line segments in this graphic illustrates, these NIMBioS Working Groups have generated a large number of connections between individuals from diverse fields.

A major emphasis at NIMBioS has been ongoing efforts to evaluate activities in light of NIMBioS objectives as outlined in the strategic plan. This ongoing attempt to develop a rubric for evaluation of an interdisciplinary research center was the focus of the NIMBioS Evaluation Manager's Ph.D. dissertation, which was completed during this reporting period. The dissertation study analyzed the effects of NIMBioS on the publication and collaboration behaviors of faculty affiliated with the center. The study also sought to determine what factors contributed to these effects for participants whose publication and collaboration behaviors were changed the most after affiliation. The dissertation was a mixed-method case study using quantitative bibliometric data along with qualitative data collected from interviews. Publication data for each participant in the study was collected from Web of Science (WOS) and analyzed by year against several demographic control variables to understand what effect affiliation with NIMBioS had on publication behaviors of participants. In addition to bibliometrics, a selection of study participants who demonstrated the most change in publication and collaboration behaviors since their affiliation with NIMBioS were interviewed to determine (a) what benefits (if any) participants felt they achieved as a result of participating in their working group, and (b) what factors (if any) participants felt may have contributed to the impact of NIMBioS affiliation on their publication and collaboration behavior. Results of the study indicate that affiliation with a NIMBioS Working Group has a significant positive effect on participant collaboration activities (i.e. number of co-authors, number of international co-authors, number of cross-institutional co-authors), and a moderate effect on publication activities (i.e. publishing in new fields). Qualitative analysis of interdisciplinarity showed a shift in publication WOS subject categories toward mathematical fields. Factors contributing to success cited by interviewees included organized leadership, a positive atmosphere, breaking into sub-groups, and the ability to collaborate with researchers

with whom they would not have interacted outside of the group.

* What opportunities for training and professional development has the project provided?

NIMBioS carries out extensive training and professional development activities. Activities during this reporting period are summarized in this section.

Nineteen undergraduates participated in the 2013 NIMBioS Research Experiences for Undergraduates (REU). Students are given training in skills such as finding relevant scientific literature, using mathematical tools to describe a biological scenario, interpreting results, designing a research plan, giving oral presentations and working collaboratively. Progress in these skills is evaluated by mentors in each of several research teams. During the 8-week program, participants live on the UT campus, and work in teams with NIMBioS postdocs and UT faculty to conduct research at the interface of mathematics and biology. Each student receives a stipend, housing and travel support. The current projects are: modeling of fetal electrocardiograms, modeling animal disease from coronavirus, mathematical detection of rare birds from audio recordings, modeling the environmental transmission of Escherichia coli in cattle, modeling protein translation and genome evolution and modeling animal social network dynamics.

NIMBioS tutorials and curriculum development workshops present tools for research and teaching. In January 2013, NIMBioS co-sponsored a curriculum workshops with SCALE-IT (UT IGERT program) on "Using Bioinformatics Data and Tools to Engage Students in Problem Solving: A Curriculum Development Workshop." This tutorial focused on strategies for bringing bioinformatics resources, data visualization tools, and an interdisciplinary perspective to teaching and learning biology for participants interested in incorporating research data and tools into their undergraduate biology courses. Participants also had the chance to work collaboratively to create a curriculum project for use in their own teaching. This tutorial was led by the BioQUEST Curriculum Consortium and the European Bioinformatics Institute and included 24 participants.

A tutorial on "Mathematical Modeling for the Cell Biology Researcher and Educator" was held with organizers from the Center for Cell Analysis and Modeling (U. of Connecticut) and the Keck School of Medicine (U. of Southern California). The mathematical foundations of reaction kinetics and different simulation techniques were presented. A total of 24 participants worked on models of their own research systems with assistance from the organizers. The Virtual Cell modeling and simulation platform was used to perform simulations.

NIMBioS took the lead in organizing the Joint MBI-CAMBAM-NIMBioS Summer Graduate Workshop. This annual 10-day workshop is for graduate students in math and biology, and the theme this year was "Connecting Mathematical Models to Biological Data". This workshop had instructors from across North America whose research expertise was mathematical modeling in biological systems using data. Some of the topics covered were: maximum likelihood, Bayesian approaches, parameter estimation, model identifiability, uncertainty and sensitivity analysis. In addition to lectures, there were daily computer activities to practice and learn techniques. In addition, each of the 39 students worked on a research project with a small team of participants.

During AY12-13, NIMBioS funded six graduate students on research fellowships. These students represented four departments across campus (Biomedical Engineering, Computer Science, Ecology and Evolutionary Biology and Mathematics). Four of the students were granted these awards based on an annual competitive application process. These students performed research in areas such as decision-making in conservation, optimal control theory for invasive species, immunology and epidemiology models and dynamic modeling of protozoan parasites. Two of the students were computer science students who were funded to assist in development and implementation of an administrative database for NIMBioS as well as facilitating high performance computing and large data visualization for a planned tutorial for biologists. A new visiting graduate student fellowship program was developed for implementation in the next award period. These fellowships support visits for up to several months by graduate students interested in pursuing research with NIMBioS senior personnel, postdoctoral fellows or Working Group participants.

As of the end of this reporting period, there are 15 Postdoctoral Fellows in residence, a total of 12 Fellows have completed their fellowships, with 4 of these leaving during this reporting period. Each postdoc is assigned two mentors,

one with more mathematical/computational expertise and one with more biological expertise. These mentors are not directing the research efforts of the postdocs, but they are expected to discuss research with the postdoc, suggest possible new projects, and provide career and training suggestions as well. Mentors are expected to meet routinely with each postdoc. The meetings may be part of any regular lab group meetings the mentor organizes. Based on reports from postdocs, all are meeting regularly or as needed with their mentors and many are attending lab meetings supervised by their mentors or others.

A Professional Development Seminar series was established this year that meets approximately monthly during fall and spring semesters. Topics for the series are chosen based on a survey of postdocs and mentors. The most frequently requested topic was the job application and interview process, which was the subject of two seminars during this reporting period. Examples of recent successful job applications by mentors and previous NIMBioS postdocs (cover letters, research and teaching statements, etc.) have been posted on a dedicated web site only available to postdocs. Other topics of high interest identified by the survey were grant proposal preparation, responding to reviews of proposals and manuscripts, and preparing effective presentations. Postdocs also participated in two training sessions on how to communicate their science to the media and to non-scientific audiences. Topics included giving elevator talks, using social media, talking to a reporter, on-camera interviewing, and poster and slide presentation tips. Postdocs are informed of other opportunities (e.g., workshops, short-courses, web sites and other information relevant to professional development) that are occurring on campus and elsewhere. Approximately 50 such opportunities were shared between January and August 2013. Topics include proposal development and writing successful grants (including NSF Career Grants), finding funding, responsible conduct of research, supercomputing, and professional positions in math-biology in the UK and Europe. All postdocs participated in ScienceLives by providing online profiles that required them to succinctly describe their work. Postdocs are provided with a travel allowance to promote their development as scientists and for career development. Presentations by postdocs are included in the listing of presentations addendum to this report.

Annual reviews of postdocs are conducted with a focus on professional and scientific development. Submission of manuscripts is an expected goal for all postdocs and other goals include presentations at national/international meetings, mentoring of undergraduates/graduate students, teaching if that is an individual career goal, and to have visited at least one of the NIMBioS minority serving institution partners. Three NIMBioS postdocs served as mentors for undergraduates during the 2013 Summer REU program.

* How have the results been disseminated to communities of interest?

The award-winning NIMBioS website (URL: http://www.nimbios.org) is the primary vehicle for communicating the scientific endeavors of NIMBioS, for both internal and external audiences. The NIMBioS website was initiated when the Institute was established in October 2008 with 40 html pages. As of June 18, 2013, the website contained 787 pages and 630 pdf documents. Its performance is monitored regularly. For the year ending June 1, 2013, unique visitors increased 72%, site visits increased 47%, and pageviews increased 29% compared to the previous year. Figure 3 and Table 2 (provided in a supporting file with this section) document the overall increasing trend in website use for this reporting period and since the inception of NIMBioS. The purpose of the website is to provide information about research at the interface of mathematics and biology and attract potential scientists/researchers to participate in the work of NIMBioS while also providing scientific information to a generalized audience. The audience for nimbios.org is multifaceted with a wide range of needs and interests, primarily consisting of scientists from academic institutions, state and federal government agencies and non-governmental organizations. Viewers searching online for information about science-related topics visit NIMBioS pages where they can view videos on science topics, read feature stories about science and scientists, interact using social media tools including sharing stories, or leave comments on the NIMBioS blog. The website provides up-to-date and accurate information about the wide range of topics addressed by NIMBioS groups and researchers, while familiarizing viewers with NIMBioS's mission and activities. The site is updated with new content on a daily basis.

Another key channel for disseminating information to NIMBioS communities of interest is the bi-monthly newsletter called "NIMBioS News." Each newsletter includes a science story, an education and outreach-related feature, a video from the library of NIMBioS-produced videos, and a listing of future educational and research opportunities. There are currently more than 4,200 subscribers, and the newsletter has an average click-through rate of about 30 percent.

NIMBioS regularly distributes e-blasts of announcements about upcoming research and educational and outreach opportunities as well as calls for support. The e-blast reaches individual email addresses and also goes to a variety of

interdisciplinary listservs and websites for placement. NIMBioS also distributes a weekly, "NEXT@NIMBioS," email with a listing of the next week's events and visiting scientists; this email is circulated to a more internal audience.

To reach a wider audience for the purposes of enhancing public understanding and increasing interest in learning about science, NIMBioS publicizes its extensive library of more than 80 NIMBioS-produced videos featuring groundbreaking research, interviews with top scientists, seminars and other educational topics. The videos are hosted on the NIMBioS YouTube channel and also featured on the NIMBioS website.

In addition, NIMBioS maintains a subscription account with EurekAlert!, an online, global news service which reaches thousands of journalists. NIMBioS press releases are disseminated via EurekAlert! as well as via its private list of media contacts. The press releases are written for a non-specialized audience interested in science topics.

Other ways NIMBioS reaches wider audiences are through its social media sites, including Facebook, Twitter, LinkedIn, Flickr, Storify, the NIMBioS WordPress Blog, and the WordPress Blogs established for NIMBioS workshops and tutorials. Each account is set to receive and respond to comments by individuals using these websites.

* What do you plan to do during the next reporting period to accomplish the goals?

In accordance with its Strategic Plan, NIMBioS will continue to utilize the following specific methods to meet its general goals: Focused research projects (Working Groups) to build collaboration among diverse communities; Building collaborations through more open-ended general problems, addressed through multiple approaches (Investigative Workshops); Skill and methods-based programs (Tutorials) that foster a broader understanding of potential applications of modern math and computational science in biology; Increasing and diversifying the workforce in cross-disciplinary research through Postdoctoral Fellowships; Visiting researcher programs including Sabbatical and Short-term opportunities for visitors to collaborate with postdocs and students, and participate in other activities; and an expansive set of education-linked-to-research endeavors from elementary through post-doctoral level that provide diverse opportunities at the math/biology interface.

A new program to be initiated during the next reporting period is support for NIMBioS Visiting Graduate Fellows who will be in residence for periods of several weeks to months. This expands our efforts to support graduate students from diverse institutions. Our previous support for graduate education has mainly been by providing support for students to participate in Investigative Workshop and Tutorial activities and as Short-term Visitors. We have advertised this new program for visits for up to several months by graduate students interested in pursuing research with NIMBioS senior personnel, postdoctoral fellows or working group participants. Visiting graduate students will work on-site at NIMBioS. The program is designed to facilitate graduate student training while fostering research at the interface of mathematics and biology. Graduate students at the beginning stages of linking theory and data are encouraged to apply.

A key component of the Strategic Plan has been a formal evaluation process, following the Evaluation Plan approved by our Advisory Board, which provides a mechanism to assess the variety of activities NIMBioS supports in terms of how effectively they contribute to meeting the NIMBioS mission. The success of the programs is evident from past participant evaluations and from Site Reviews. We have re-envisioned our evaluation program in part because participant responses have been so highly positive that we gain little additional information by continuing to evaluate each individual activity. Thus we have been transitioning our evaluation effort toward the science of evaluating collaborative interdisciplinary activities and the effectiveness of centers such as NIMBioS. In coordination with our communication and education staff members, we intend to continue to develop methods to assess the effectiveness of interdisciplinary education and collaboration efforts as part of the science of team science. A key component that will assist this effort is the planned completion of the NIMBioS Administrative DataBase system, which will more effectively allow us to coordinate all aspects of the demographic information and evaluation responses we obtain from participants.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
figure_1_and_table_1_signifresults.pdf	This supporting file contains: Figure 1.	Louis	07/23/2013

Filename	Description	Uploaded By	Uploaded On
	Diversity of scientific topics represented in NIMBioS activities. Table 1. Number of articles related to NIMBioS activities published in top national and international journals in 2012-2013.	Gross	
figure2_NIMBioS_infographic.pdf	This supporting file contains Figure 2. NIMBioS At-A-Glance Infographic, which illustrates the cross-disciplinary connections fostered through NIMBioS activities.	Louis Gross	07/23/2013
figure_3_and_table_2_website.pdf	This supporting file contains Table 2 and Figure 3, which show an overall trend of increasing nimbios.org website visits and unique visitors (site use data from Google Analytics).	Louis Gross	07/23/2013

Products

Journals

Federico, Paula; Gross, Louis J.; Lenhart, Suzanne; Ryan, Dan (1/1/13). Optimal Control in Individual-Based Models: Implications from Aggregated Methods. *AMERICAN NATURALIST*. 181 (1), 64-77.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

Agusto, Folashade B.; Bewick, Sharon; Parshad, Rana D. (9/1/12). Mosquito management in the face of natural selection. *MATHEMATICAL BIOSCIENCES*. 239 (1), 154-168.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes

Agusto, Folashade B.; Del Valle, Sara Y.; Blayneh, Kbenesh W.; Ngonghala, Calistus N.; Goncalves, Maria J.; Li, Nianpeng; Zhao, Ruijun; Gong, Hongfei (3/7/13). The impact of bed-net use on malaria prevalence. *JOURNAL OF THEORETICAL BIOLOGY*. 320 58-65.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; DOI: 10.1016/j.tree.2012.12.002

Barton, Benjamin H.; Moran, Emily (3/1/13). Measuring Diversity on the Supreme Court with Biodiversity Statistics. *JOURNAL OF EMPIRICAL LEGAL STUDIES*. 10 (1), 1-34.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

Berg, C. L.; Chow, J. S.; Mcgee, M. D.; Wainwright, P. C. (4/1/13). Divergent feeding kinematics in two Amazonian cichlids. *INTEGRATIVE AND COMPARATIVE BIOLOGY*. 53 E246-E246.

Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Technologies or Techniques
Nothing to report.

Patents
Nothing to report.

Inventions
Nothing to report.

Licenses
Nothing to report.

Websites

Title:	The NIMBioS Website
URL:	http://nimbios.org/
Description:	The NIMBioS website became operational October 1, 2008.　Visitor traffic is monitored by Google Analytics. For the period October 1, 2008 through June 1, 2013, NIMBioS.org received 304,853 visits and 885,840 page views from 162,450 unique visitors, spending an average of 2.45 minutes on site and viewing an average of 2.91 pages per visit. For the year ending June 1, 2013, unique visitors increased 72%, site visits increased 47%, and pageviews increased 29% compared to the previous year. Thirty-two percent of visitors viewed a single page; 20 percent viewed more than 3 pages; 13 percent viewed more than 4 pages. Visits have originated from 9,756 cities in 202 countries/territories, using 146 languages. More than 50 percent of visits are identifiable as originating from colleges or universities.

The site currently has 767 html pages and 630 pdf documents. An additional 67 html pages and 438 pdf documents were created for the 2012 Society for Mathematical Biology Annual Meeting and Conference website, hosted by NIMBioS. Pages with the highest visitor traffic include the front page, a press page feature article, personnel pages, calendar / announcements, education page, and pages describing research opportunities and activities for postdoctoral fellows, undergraduates, working groups, and workshops, and pages associated with SMB2012.

Title: Mathematical Modeling for the Cell Biology Researcher and Educator

URL: http://www.nimbios.org/wordpress-training/cellbiology/

Description: The site is a WordPress blog for the NIMBioS Tutorial: Mathematical Modeling for the Cell Biology Researcher and Educator, which was held April 8-10, 2013. The site was designed to facilitate group communication and information sharing before, during and after the tutorial.

Title: The NIMBioS Blog

URL: http://www.nimbios.org/wordpress/

Description: The NIMBioS blog is an interactive social media site established in August 2010 to showcase NIMBioS news and provide an outlet for readers' commentary.

Title: NIMBioS Investigative Workshop: Modeling Blood Cell Interactions

URL: http://www.nimbios.org/wordpress-training/bloodcell/

Description: The site is a WordPress blog for the NIMBioS Investigative Workshop: Modeling Blood Cell Interactions, which was held June 5-7, 2013. The site was designed to facilitate group communication and information sharing before, during and after the workshop.

Title: NIMBioS Twitter

URL: https://twitter.com/nimbios

Description: The NIMBioS Twitter account is an interactive social media site with 1,407 followers and 1,212 tweets (as of June 18, 2013) that feature NIMBioS news events and happenings as well as re-tweets of relevant news to the scientific community.

Title: NIMBioS Facebook

URL: https://www.facebook.com/nimbios

Description: NIMBioS Facebook page is an interactive social media site with 422 "likes" and posts that feature NIMBioS news, events and photos of interest to the NIMBioS Facebook community.

Title: NIMBioS Storify

URL: http://storify.com/NIMBioS

Description: The NIMBioS Storify site is an interactive social media site with stories created by NIMBioS that comprise all related URL content and photos.

Title: NIMBioS Flickr

URL: http://www.flickr.com/photos/nimbios/

Description: The NIMBioS Flickr features sets of photos from various NIMBioS activities and events, both formal and informal.

Other Products

Product Type: Audio or Video Products

Description: Workshop Video. June 14, 2013. A mechanochemical mechanism for rapid changes in cell shape. Shared via NIMBioS' YouTube account. URL: http://youtu.be /2G1x4VhxqzM

Other: Audio or Video Products

Product Type: Video Interview. June 11, 2013. Animal Networks. Shared via NIMBioS' YouTube
Description: account. URL: http://youtu.be/_Dh-gL-Dn8s

Other:	Audio or Video Products
Product Type: Description:	Workshop Video. June 10, 2013. Integrating signaling with adhesive dynamics to simulate adhesion of blood cells. Shared via NIMBioS' YouTube account. URL: http://youtu.be/zNzcCzrgU6k

Other:	Audio or Video Products
Product Type: Description:	Seminar Video. April 3, 2013. Social networks in the hyrax and the hyena: from static to dynamic. Shared via NIMBioS' YouTube account. URL: http://youtu.be /oDbsVSorOLU

Other:	Audio or Video Products
Product Type: Description:	Workshop Video: March 18, 2013. A control theory approach to engineering biomolecular networks. Shared via NIMBioS' YouTube account. URL: http://youtu.be /bLxmX3Vaa_k

Other:	Audio or Video Products
Product Type: Description:	Seminar Video. Feb. 22, 2013. Estimating biting rates of triatomine on preferred sylvatic hosts in overlapping vector-host cycles. Shared via NIMBioS' YouTube account. URL: http://youtu.be/RwHj5Cq4un8

Other:	Audio or Video Products
Product Type: Description:	Seminar Video. Feb. 15, 2013. Agent-based approach to malaria: Immunology, population genetics and evolution of virulence. Shared via NIMBioS' YouTube account. URL: http://youtu.be/9JHc2Q2Rxrg

Other:	Audio or Video Products
Product Type: Description:	Seminar Video. Jan. 31, 2013. The mathematics behind animal vocal communication. Shared via NIMBioS' YouTube account. URL: http://youtu.be/LgYKiN-kPrg

Other:	Audio or Video Products
Product Type: Description:	Seminar Video. Jan. 30, 2013. The sound of fear: A journey from marmot meadows to Hollywood. Shared via NIMBioS' YouTube account. URL: http://youtu.be /YlmhZV1WhPA

Other:	Software or Netware
Product Type: Description:	Berry M, Day J, Franklin M, Ganusov V, Koessler D, Martin J, Reardon C, Rempe C, Srinivasan S. 2012. Online Tutorial: Python for Biologists.

Other:	Models
Product Type: Description:	Gurarie D. 2013. Reed-Frost SEIR Model (CDF tool for simulating SEIR systems with variable parameters). Wolfram Demonstrations Project.

Other:	Software or Netware
Product Type: Description:	Gurarie D. 2013. Mathematica code for "Optimal control of dynamical systems (ODE and PDE)."

Other:	Databases
Product Type: Description:	Turchin P, Storrs CT. 2012. Software: Historical Database of Sociocultural Evolution (SESHAT).

Other:	Survey Instruments
Product Type:	Participant Demographic Survey

Description: This survey was designed by the NIMBioS Evaluation Manager and collects basic demographic data to gauge whether our program is fairly reaching and benefitting everyone regardless of demographic category and to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities, and to assess involvement of international participants in the program. Submission of the requested demographic information by participants is voluntary and does not affect the participant's eligibility for selection into NIMBioS events. Anonymized information from the survey is shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other reporting capacities for the purpose of program assessment.

Other: Survey Instruments

Product Type: Program Evaluation Surveys

Description: These surveys was designed by the NIMBioS Evaluation Manager and collects information directly from participants after each NIMBioS event and contribute the evaluation of the institute as a whole. Questions on the surveys focus on a number of event-specific areas, to include: participant satisfaction in a number of areas, appropriateness of content, meeting of expectations, knowledge gains, progress toward stated goals, impact on future research, impact on career choice, impact on collaborative activities. Anonymized information from the survey is shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other reporting capacities for the purpose of program assessment.

Other: Databases

Product Type: NIMBioS Participant Database

Description: The NIMBioS participant database was designed by the NIMBioS Evaluation Manager and is used to store and query information about participant demographics, events, and scholarly products arising from these events. The database is shared internally among NIMBioS staff and the Leadership Team, and data from the database are shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other reporting capacities for the purpose of program assessment.

Other:**Supporting Files**

Filename	Description	Uploaded By	Uploaded On
Additional_Products.pdf	NIMBioS had >127 products to report. As directed in the Awardee Alert, we deleted products to get below the 127 limit. This supporting file includes a complete listing of the products that were originally entered into RESEARCH.GOV.	Louis Gross	07/25/2013

Participants

Research Experience for Undergraduates (REU) funding

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked

Name	Most Senior Project Role	Nearest Person Month Worked
Nicole Bender	Research Experience for Undergraduates (REU) Participant	2
Robert Adams	Research Experience for Undergraduates (REU) Participant	2
Conrad Beckman	Research Experience for Undergraduates (REU) Participant	2
Judy Bloom	Research Experience for Undergraduates (REU) Participant	2
Samuel Estes	Research Experience for Undergraduates (REU) Participant	2
Brittany Hale	Research Experience for Undergraduates (REU) Participant	2
Kevin Hoang	Research Experience for Undergraduates (REU) Participant	2
Erick Kalobwe	Research Experience for Undergraduates (REU) Participant	2
Jocelyn Keung	Research Experience for Undergraduates (REU) Participant	2
Jacob Lambert	Research Experience for Undergraduates (REU) Participant	2
Christian Mason	Research Experience for Undergraduates (REU) Participant	2
Monica Napoles	Research Experience for Undergraduates (REU) Participant	2
Christopher Oballe	Research Experience for Undergraduates (REU) Participant	2
Natasha Rudy	Research Experience for Undergraduates (REU) Participant	2
Kathryn Schaber	Research Experience for Undergraduates (REU) Participant	2
Sunil Shahi	Research Experience for Undergraduates (REU) Participant	2

Name	Most Senior Project Role	Nearest Person Month Worked
Kiersten Utsey	Research Experience for Undergraduates (REU) Participant	2
Michael Vella	Research Experience for Undergraduates (REU) Participant	2
Rachael Ward	Research Experience for Undergraduates (REU) Participant	2
Adam Sullivan	Graduate Student (research assistant)	5
Eric Numfor	Graduate Student (research assistant)	5
Marco Martinez	Graduate Student (research assistant)	5
Mark Blaise DeCotes	Graduate Student (research assistant)	6
John Martin	Graduate Student (research assistant)	6
Michelle Lawing	Postdoctoral (scholar, fellow or other postdoctoral position)	9
Andrew Kanarek	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Tom Ingersoll	Postdoctoral (scholar, fellow or other postdoctoral position)	6
Orou Gaoue	Postdoctoral (scholar, fellow or other postdoctoral position)	9
Juanjuan Chai	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Calistus Ngonghala	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Maud Lelu	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Daniel Ryan	Postdoctoral (scholar, fellow or other postdoctoral position)	8
Gesham Magombedze	Postdoctoral (scholar, fellow or other postdoctoral position)	12

Name	Most Senior Project Role	Nearest Person Month Worked
Jiang Jiang	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Jeremy Beaulieu	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Amiyaal Ilany	Postdoctoral (scholar, fellow or other postdoctoral position)	11
Keenan Mack	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Sergey Gavrilets	Co-Investigator	3
Suzanne Lenhart	Co-Investigator	4
Louis J Gross	PD/PI	11
Chandra Eskridge	Other Professional	12
Jennifer Thomas	Other Professional	12
Michael Peek	Other Professional	11
Jane Comiskey	Technician	11
Eric Carr	Other Professional	11
Pamela Bishop	Other Professional	12
Toby Koosman	Other Professional	12
Kelly Sturner	Other Professional	12
Catherine Crawley	Other Professional	12
Ryan Martin	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Arik Kershenbaum	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Julia Earl	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Chris Remien	Postdoctoral (scholar, fellow or other postdoctoral position)	11

Name	Most Senior Project Role	Nearest Person Month Worked
Clemente Aguilar	Postdoctoral (scholar, fellow or other postdoctoral position)	2
Gwen Iacona	Graduate Student (research assistant)	5
Matthew Spencer	Other Professional	5
Hong Qin	Other Professional	2
Shigetoshi Eda	Faculty	3
Cristina Lanzas	Faculty	2
Paul Armsworth	Faculty	2
Susan Riechert	Faculty	2
Michael Gilchrist	Faculty	1
Nate Sanders	Faculty	1
Brian O'Meara	Faculty	1
Judy Day	Faculty	2
Gordon Burghardt	Faculty	1
Xiaopeng Zhao	Faculty	1
Melissa Kennedy	Faculty	1
David Buehler	Faculty	1
Tuoc Phan	Faculty	1
Shi Chen	Other Professional	1
Heather Finotti	Faculty	1
Kelsey Bratton	Undergraduate Student	1
Virginia Mills	Undergraduate Student	1
Ellen Ford	Undergraduate Student	2
Ana Richters	Other Professional	8

Name	Most Senior Project Role	Nearest Person Month Worked
Alison Buchan	Co-Investigator	1
John New	Co-Investigator	1
Christopher Welsh	Co-Investigator	11
Ernest Brothers	Co-Investigator	3
David Gurarie	Other Professional	8

What other organizations have been involved as partners?

Name	Location
4H	Knoxville, TN
American Association for the Advancement of Science	Washington, DC
American Institute of Biological Sciences	Reston, VA
Animal Diversity Web	University of Michigan
Association for Women in Mathematics	Fairfax, VA
BioQUEST Curriculum Consortium	Madison, WI
Biology in a Box	University of Tennessee
CURENT	Knoxville, TN
California State University San Marcos Foundation	San Marcos, CA
Center for Discrete Mathematics & Theoretical Computer Scien	Rutgers University
Center for Remote Data Analysis and Visualization	University of Tennessee
Centre for Applied Mathematics in Bioscience and Medicine	McGill University, Montreal, Canada
European Bioinformatics Institute	Cambridgeshire, UK
Fisk University	Nashville, TN
Great Smoky Mountains Institute at Tremont	Townsend, TN
Great Smoky Mountains National Park	Gatlinburg, TN

Name	Location
Greater Knoxville Math/Science Coalition	Knoxville, TN
Howard University	Washington, DC
Joint Institute for Computational Science	University of Tennessee and Oak Ridge National Laboratory
Mathematical Biosciences Institute	Ohio State University
Mathematics of Planet Earch	University of Montreal, Canada
NSF Mathematical Sciences Institutes	various
National Center for Ecological Analysis and Synthesis	University California - Santa Barbara
National Center for Medical Intelligence	Washington, DC
National Ecological Observatory Network, Inc	Boulder, CO
National Evolutionary Synthesis Center	Durham, NC
National Institute for Computational Science	University of Tennessee
National Socio-Environmental Synthesis Center	University of Maryland
North Carolina A&T University	Greensboro, NC
Oak Ridge National Laboratory	Oak Ridge, TN
Program for Excellence and Equity in Research (PEER)	University of Tennessee
Scalable Computing and Leading Edge Innovative Technologies	University of Tennessee
Society for Industrial and Applied Mathematics	Philadelphia, PA
Society for Mathematical Biology	international
Society for the Advancement of Chicanos and Native Americans	Santa Cruz, CA
Southern Appalachian Girl Scout Council	Knoxville, TN
Tennessee Department of Environmental Conservation	Nashville, TN
Tennessee Ornithological Society	Clinton, TN

Name	Location
Tennessee Science Teachers Association	Tennessee
Tennessee State University	Nashville, TN
U.S. Fish & Wildlife Service	Washington, DC
USDA - APHIS - WS - National Wildlfie Research Center	Fort Collins, CO
UT Center for Enhancing Education in Mathematics and Science	University of Tennessee
University of Texas El Paso	El Paso, TX
VolsTeach	University of Tennessee
Wildlife Diseases Association	Royal Oaks, CA
iPlant Collaborative	Tucson, AZ

Have other collaborators or contacts been involved? Y

Impacts

What is the impact on the development of the principal discipline(s) of the project?

Activities supported by NIMBioS have had strong impact on a number of biological sub-disciplines. The following provides some highlights grouped by the type of activity. We have chosen these examples as they cover most of the subject areas present in Figure 1 in the supporting file uploaded to the Accomplishments portion of this report. However what we present is a sample of the activities in the subject areas.

Postdoctoral Fellows Tucker Gilman and Tony Jhwueng published a joint paper in Nature that models coevolution of parasites and hosts. This shows that the multidimensionality of the trait space favors escape from parasites and pathogens. This work significantly extends the biological realism of coevolutionary models and identifies a novel evolutionary factor controlling host-parasite interactions. Notably, before their stay at NIMBioS, Drs. Gilman and Jhwueng worked in completely different areas of research (evolutionary ecology in the case of Dr. Gilman and statistical phylogenetics in the case of Dr. Jhwueng).

Postdoctoral Fellow Xavier Thibert-Plante published a paper in Ecology Letters on the evolution of mate choice. Dr. Thibert-Plante used high-performance computing methods to analyze a variety of mechanisms of nonrandom mating within several ecological scenarios. His numerical results, which are unprecedented in scale, explain a puzzling commonality of traits that affect both local adaptation and mating preferences simultaneously.

A Working Group on Within-host modeling of Mycobacterium avium subsp. paratuberculosis (MAP) infections published two papers in the journal Preventative Veterinary Medicine studying the effects of vaccination to prevent the invasion of the bacterium. Their results explain why MAP vaccination might have a beneficial, negligible, or detrimental effect in the reduction of prevalence and show that vaccines that are beneficial to individual animals may not be useful for a herd-level control plan.

A Working Group on Cross-Topology Registration produced a review paper in Trends in Ecology & Evolution on genetics and evolution of function-valued traits. To study such traits the Working Group has developed new 'function-valued' methods which use the order, spacing, and functional nature of the data typically ignored by traditional univariate and

multivariate analyses. These rapidly developing methods account for the continuous change in traits of interest in response to other variables, and are superior to traditional summary-based analyses for growth trajectories, morphological shapes, and environmentally sensitive phenotypes.

An Investigative Workshop on Mathematical Modeling of Wildlife Zoonoses led to a project studying transmission cycles at the human-animal interface. A resulting paper focusing on the role of animal reservoirs in maintaining gambiense human African trypanosomiasis was published in PLOS Computational Biology. The researchers show that, when highly resolved land cover data are used to predict farm locations, accurate predictions of epidemic sizes, durations, and preferred intervention strategies can be obtained.

A workshop on infectious disease modeling led to a publication in Philosophical Transactions of The Royal Society B. The researchers provided a comprehensive review of the state of knowledge of the geographical distribution of all infectious diseases of clinical significance to humans. They also argued that rapid improvement in the landscape of infectious diseases mapping can be made by embracing non-conventional data sources, automation of geo-positioning and mapping procedures enabled by machine learning and information technology, respectively, in addition to harnessing labor of the "volunteer cognitive surplus" through crowd-sourcing.

Sabbatical visitor Karen Page (Univ. College London, UK) contributed to a project studying gene regulatory networks used for reading the Sonic Hedgehog signaling gradient in the vertebrate neural tube. The paper summarizing the results was published in the journal Cell. Another sabbatical visitor, James Degnan (Univ. of Canterbury, New Zealand), published four papers on coalescence and phylogenetics including one in the highly regarded journal Theoretical Population Biology. Sabbatical visitor Matthew Spencer (Liverpool) published a paper in Ecology Letters on data-driven models for regional coral-reef dynamics.

What is the impact on other disciplines?

Social sciences: anthropology, history, political sciences, economics:
NIMBioS held a joint Investigative Workshop on "Modeling Social Complexity" attended not only by biologists and mathematicians but also by anthropologists and political scientists. This workshop generated two applications for Working Groups which were approved following evaluations by the NIMBioS Advisory Board. The first meeting of the "Evolution of Hierarchy and Leadership" Working Group took place in April of 2013. The first meeting of the "Evolution of Complex Institutions" working group will take place in March of 2014. Both Working Groups have attracted participants from social sciences; their work will be of relevance for anthropology, history, economics, and political sciences. Another example is a recent publication by a participant of an earlier Working Group on "Coalitions and Alliances" (Brian Skyrms, UCLA) in a collective volume entitled "Complexity and aspects of naturalizing the social contract institutions: markets, norms and corporations". NIMBioS postdoc Emily Moran collaborated with a UT Law School faculty member to develop a peer-reviewed paper in the Journal of Empirical Legal Studies. This paper was the first to analyze diversity of backgrounds on the US Supreme Court using statistical methods developed in biodiversity research. Another NIMBioS postdoc, Calistus Ngonghala, is carrying out reserach with an emphasis on the sociology of poverty. He has published a paper in the Journal of The Royal Society Interface which uses models to show how clusters of poverty may emerge via epidemiological networks.

Human sexuality:
A collaboration in a Working Group on "Intragenomic Conflict" followed by a short-term visit resulted in publication of a paper by Bill Rice and co-authors offering a new explanation, supported by a mathematical model, for the maintenance of homosexuality in humans. This paper received worldwide news coverage (CNN, Time, US News and World Report, Fox News, Huffington Post, Science, etc), has been downloaded tens of thousands of times, and has played an important role in the ongoing debate on homosexuality in society. The publication of this paper also resulted in a large spike in NIMBioS web site traffic.

Psychology:
Participation in a Working Group on "Evolution of Play" resulted in a publication by Elisabetta Pelagi in a collective volume entitled "A handbook of solitude: psychological perspectives on social isolation, social withdrawal, and being alone". Two publications in Proceedings of the National Academy of Sciences, on the evolutionary origins of pair-bonding and on human egalitarian preferences, have stimulated lively public and scientific discussions of the importance and relevance of

our evolutionary past for understanding social behavior and preferences of modern humans. These publications were an outcome by a Working Group on "Coalitions and Alliances".

Medicine and medical engineering:
Senior NIMBioS Personnel Xiaopeng Zhao published papers modeling electromechanics of the heart and developing a method for improving the quality of ECGs. NIMBioS postdoc Dan Ryan has started a collaboration with Senior NIMBioS Personnel Xiaopeng Zhao on machine learning problems with biomedical applications using "deep learning" techniques to improve ICU mortality prediction as well as a project using maternal ECG signals for fetal ECG monitoring. An Investigative Workshop "Modeling Metabolism and Body Weight Regulation" led to a publication analyzing and modeling the process of weight loss following physical exercises. NIMBioS postdoc Chris Remien is integrating mathematical modeling of liver injury from acetaminophen with data analysis using a large database of patients through the Acute Liver Failure Study Group.

Evaluation and Assessment:
The dissertation of NIMBioS Evaluation Manager Pamela Bishop is a major contribution on the use of formal evaluation methods to ascertain the impact of an interdisciplinary center on the development of collaborations. Using NIMBioS as a case study, the methods utilized include a mixture of bibliographic and interview methods, along with self-reported evaluations, to assess the formation of new interdisciplinary collaborations.

Education:
NIMBios has fostered a large array of outreach activities for K-12 teachers and students. For example, NIMBios collaborated with the Tennessee Ornithological Society to develop a Discover Birds Activity book for K-12 students, and has led several activities using this material. NIMBioS staff worked to ensure inclusion of quantitative examples in this activity book, therefore connecting elementary school level math with observational biology. For the Biology-in-a-Box project, NIMBioS collaborated to develop new quantitative material in each of 10 boxes that are used in over 100 school systems. These boxes are utilized in both science and math classes at K-12 level and provide educators with an opportunity to link these two subject areas that are more typically treated independently.

What is the impact on the development of human resources?

For undergraduate students, our two main activities are the Research Experiences for Undergraduates (REU) summer program and Undergraduate Research Conference at the Interface Between Biology and Mathematics. Our REU program is described under the training and professional development section of this report. About one-third of the REU participants were from underrepresented groups. Invitations to the 5th annual research conference were extended to undergraduate students engaged in research in biology and mathematics, their faculty mentors, Minority Serving Institution partners and high school teachers. The conference included student talks and posters, two guest plenary speakers, a panel on careers in math biology, and a graduate school showcase. Over 110 undergraduates and faculty from academic institutions across North America were in attendance. There were 59 undergraduate research oral presentations and posters. These activities provide students with exposure to the scientific community and also valuable network opportunities.

A visitor program of NIMBioS postdocs and Leadership Team has been in place with the NIMBioS minority-serving institution partners: California State University-San Marcos, Fisk University, Howard University, and University of Texas-El Paso. In addition to offering an opportunity to discuss their research with faculty at these institutions, NIMBioS postdocs gain cross-cultural experiences with these visitations. Following on a visit to North Carolina A & T University, another partnership is being developed. Additionally, postdocs were provided with a seminar on cross-cultural mentoring to enhance their cultural competence when interacting and presenting to diverse populations.

The Biology in a Box program employs a hands-on, inquiry-based approach to teach the wonders of the living world, as well as introducing the needed scientific methods and math skills. Each Biology in a Box set consists of ten boxes each representing a different thematic unit. Over recent years, these K-12 materials have been distributed to more than 100 school systems in Tennessee and other states. NIMBioS has worked with the developer of this program, Dr. Susan Riechert to revise all ten existing theme sets to add grade-level appropriate math exercises. Curriculum standards for science and mathematics are now available online as are alphabetical indexes of the inquiry exercises offering particular

respective science and mathematics topics.

NIMBioS took the lead on organizing the Modern Math Workshop immediately preceding the SACNAS (Society for the Advancement of Chicanos & Native Americans in Science) Annual Conference. The goal of this project was twofold: (1) to reinvigorate the research careers of minority faculty and postdocs and mathematics faculty at minority-serving institutions by recruiting them to participate in the 2013-2014 research programs and workshops of US-based Mathematics Institutes and (2) to increase awareness of math-based career paths among minority undergraduate and graduate students. The workshop had 170 participants and took place in Seattle, WA, October 10-11, 2012.

NIMBioS is involved in some activities in East Tennessee to encourage students to learn about the interface of mathematics and biology, and we mention a few examples here. NIMBioS collaborated with CURENT (a UTK-based NSF-funded Engineering Research Center) and 4-H to offer a week-long summer day camp, Adventures in STEM Camp, for 24 rising 7th and 8th grade girls on STEM. At the Big Orange Science Symposium, a Saturday event designed to recruit area high school students to STEM careers, Suzanne Lenhart spoke on the faculty panel and along with the NIMBioS Outreach and Education Coordinator Kelly Sturner, hosted a NIMBioS information table on science/math careers. Deputy Director Chris Welsh and Kelly Sturner designed two math and biology activities to be included in the Discover Birds activity booklet, published by the Tennessee Ornithological Society. The books were donated to schools that the Knoxville Chapter of the Tennessee Ornithological Society visited. Kelly Sturner served on the organizing committee and also helped to facilitate a Teaching Evolution workshop for area K-12 teachers as a part of the week of Darwin Day events on the UTK campus. About 30 teachers participated in activities to teach the science supporting evolution, discussed the challenges of teaching evolution in their classrooms, and also had the opportunity to ask questions from a panel of education experts.

NIMBioS Associate Director for Diversity Enhancement Ernest Brothers utilized a mapping application called BatchGeo to develop a geographic listing of HBCUs and other MSIs with graduate programs in Biology and Mathematics along with contacts for those programs. He has used this instrument to further develop and promote diversity enhancement by notifying contacts about opportunities for faculty and students at NIMBioS, and also to strategically schedule campus visits to recruit or establish new partnerships. Other applications of this instrument include using it as a vehicle to recruit minority faculty and postdocs at minority-serving institutions to participate in the 2013-2014 research programs and workshops of US-based Mathematics Institutes and the NSF-Biology Synthesis Centers.

What is the impact on physical resources that form infrastructure?

The University of Tennessee has carried out extensive renovations to the space that previously housed NIMBioS as well as the space that currently houses NIMBioS. These facilities are now much better aligned to meet the needs of fostering interdisciplinary collaboration including new facilities for video archiving of activities. Furthermore, due to these investments, the University of Tennessee has now co-located four major projects, each of which receives NSF support, and all of which have a significant computational science component. These projects are NIMBioS, the UT/ORNL Joint Institute for Computational Science, the Computational Geography Research Group and the Innovative Computing Laboratory. This physical proximity enhances the likelihood of further collaborations.

What is the impact on institutional resources that form infrastructure?

The commitments arising from UTK to support new faculty positions (six have been hired to date) in conjunction with NIMBioS have a highly significant long-term impact on the future of interdisciplinary research at UTK. This has a direct impact on the expansion of opportunities for research and education in Tennessee that go beyond the historical emphasis on ecology, epidemiology and evolution that has existed here previously. For example, there are now significant research and educational activities at the interface of immunology, ecology and infectious diseases that did not exist prior to NIMBioS.

What is the impact on information resources that form infrastructure?

NIMBioS is collaborating with the NSF-XSEDE RDAV project to develop new toolsets, particularly in R, for high performance computers. These toolsets are designed to allow investigators from several different areas of biology to investigate problems they might have otherwise avoided due to the computational complexity involved. These toolsets will be distributed as open source to enhance the opportunity for broad dissemination and use. An objective is to facilitate

opportunities for their application on platforms of quite different scales, from single workstations with a small number of processors, to clusters with hundreds to thousands of processors, to supercomputers with many thousands of processors.

NIMBioS is developing a database system to effectively manage the variety of data it requests of participants, to manage applications for activities, and to support the variety of evaluation activities here. This database system is being developed in such a way that it could be deployed at other similar centers with the diverse range of activities and requirements that NIMBioS has.

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?

Many of the activities supported by NIMBioS have the potential for direct impacts on public policy. For example, the activities of the Working Group "'Pretty Darn Good' Control: Extensions of Optimal Control for Ecological Systems" could have direct implications for regulations in fisheries management, but also have broader impacts with regard to regulations that must account for uncertainty in future conditions. Another example concerns a recent paper published by a current NIMBioS postdoc and several collaborators on the impact of bed-nets for controlling malaria. This points out the magnitude of use of bed-nets that may eradicate malaria in a region and thus could inform education and distribution policies for bed-nets. Approximately a fifth of NIMBioS activities to date have involved infectious diseases that have direct or indirect impacts on humans. Each one of these activities could lead to suggestions for policy changes to reduce the harmful impacts of disease. For example, a major report published in the Proceedings of the Royal Society B and supported by NIMBioS, describes the level of knowledge associated with the current state of world-wide mapping for more than 300 infectious diseases that impact humans. Results from this paper may be used to inform resource allocation to research and monitoring efforts, since the paper provides to determine the uncertainty in current disease maps and thus prioritize future efforts.

Changes

Changes in approach and reason for change
Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

Special Requirements

Responses to any special reporting requirements specified in the award terms and conditions, as well as any award specific reporting requirements.

Per reporting requirements of this award, an addendum is attached which includes:

1. Fall 2012 NIMBioS Board of Advisors Meeting Report

2. NIMBioS Evaluation Report

3. Full list of participants by activity

4. Description of activities

5. Additional products (presentations, grants/proposals, featured articles, and meetings/workshops/symposia) not previously reported in the Products section

Supporting Files

Filename	Description	Uploaded By	Uploaded On
NIMBioSAnnualReport_Aug2012-Sep2013_addendum.pdf	Additional reporting: (1) Board meeting reports, (2) NIMBioS Evaluation Report, (3) List of participants by activity, (4) Description of activities, and (5) Additional products not previously reported	Louis Gross	07/26/2013

Addendum to NIMBioS Annual Report
Sep 1, 2012 –Aug 31, 2013

Addendum to NIMBioS Annual Report

Sep 1, 2012 –Aug 31, 2013

Y5-1. NIMBioS Board of Advisors Meeting Summaries

Summary Report of NIMBiOS Board of Advisors Meeting held October 11-12, 2012

Submitted by Louis Gross

This is a brief summary of the discussions and recommendations made by the Advisory Board during the meetings held from 08:50 on October 11 to noon on October 12. The agenda for the meeting is included below. A little over three weeks prior to the meeting, information on all requests for support submitted by the September 1, 2012 deadline was provided to the Board via a password-protected link off the NIMBiOS website. This included links to original requests, and board members were each assigned 2-4 requests to review for the various activities, with the assignments made based upon Board member expertise, the topic of the application and their stated preference for evaluating postdoc applications or other requests. An online review form allowed all Board members to report their comments and overall rating for the variety of requests and these were collated and summarized just prior to the meeting. These reviews were open to all Board members at the time of the meeting, and served as the starting point for discussions during the meeting. In addition, NIMBiOS leadership provided access to a variety of documents including the 4-Year Site Visit Report, the NIMBiOS response to the Site Visit Report, the NIMBiOS renewal proposal, the NIMBiOS Annual Report and Strategic Plan, latest summaries of evaluations of NIMBiOS activities, a report on diversity of NIMBiOS participants, and the Postdoctoral Research Fellow Mentoring Plan.

The meeting, led by Board Chair Susan Holmes, was attended by eight members of the Board with three additional members calling in via teleconference. Many other members of the Board provided recommendations on the requests for support via the web interface. Also in attendance were the NIMBiOS Leadership Team and several NIMBiOS staff members. The focus of the NIMBiOS Advisory Board meeting was on evaluating working group, workshop, sabbatical, and post-doctoral fellow requests for support. The Board provided recommendations on the various requests for support but also discussed a number of other issues.

As this was the first Board meeting in NIMBiOS' new space in the Claxton Building, the day began with an informal tour of the facilities. Following the call to order by Susan Holmes and approval of the agenda, the formal meeting began with a brief Director's Report by Louis Gross thanking those who have rotated off the Board, welcoming new members, and providing a summary of activities over the time since NIMBiOS opened, a description of the array of collaborations that have been established with other institutions, and information about several other initiatives. The Director's report ended with a list of issues about which the Leadership Team requested input from the Board.

Requests for support. Discussion of the various support requests proceeded following the order in the agenda. Any individual who had a conflict of interest regarding any request did not participate in the discussion of that request and left the room so as not to hear the comments. The Board discussion led to the following recommendations:

1. Sabbatical visitors – the Board recommended accepting two of the three applicants.

2. Working Groups – the Board recommended that three of the requests be approved, one be approved pending acceptable revisions, and one be encouraged to resubmit. For those recommended to be approved or resubmitted, the Board provided advice to the Leadership Team regarding potential changes to the suggested participants.

3. Postdoctoral Fellowships –The NIMBiOS Leadership Team submitted five post-doc requests for review by the Board. These applicants were reviewed and discussed in detail during the meeting. The Board did

not recommend any for acceptance but suggested one should be considered further by the Leadership team and possibly encouraged to reapply.

4. Workshops – The Board recommended that two of three workshop requests be approved and one be encouraged to resubmit.

Discussion of NIMBioS Future Plans

Over the remainder of the day and through much of the next day's meeting, the Board discussed several issues, summarized below:

1. *Site Review and response*. The Board was supplied with the report from the external site review held a few months earlier and the response to this review provided by the Leadership Team. Discussion of this included issues related to the size and diversity of the Board with the Board recommending that the size of the Board should not be changed greatly, but that some additional members might enhance the capacity of the Board to evaluate requests from areas not currently well represented. However the Board did not suggest that every area of biology must be represented.

2. *Renewal Proposal*. A summary of the renewal proposal was provided and discussed.

3. *Strategic Plan*. The focus of discussion was the change, suggested in the renewal proposal, regarding partner institutions. The Board concurred that an emphasis on industry partnerships was not needed at this time but encouraged reconsideration of this potential for NIMBioS to have enhanced long-term sustainability once a new Director was appointed.

4. *Enhancing topical and participant diversity*. There was extensive discussion on the current benchmarks for diversity of participation in, and organizing of, NIMBioS activities. It was suggested that the Leadership Team should look into the literature on benchmarks and perhaps could increase the diversity of participants by simply increasing the number of activities. It was also noted that NIMBioS should set goals for diversity that are not necessarily aligned with the available pool of participants, but with where we want to be as a nation. An alternative benchmark was discussed that the organizers of Working Groups and Workshops should reflect the diversity of the participants in these activities. Suggestions were made to attempt for greater involvement from individuals in mathematics education and that it would be appropriate to further encourage activities on math biology education that might attract those from mostly teaching institutions which have large fractions of students from under-represented groups. A particular suggestion was to develop a means to provide release-time support for faculty from minority-serving institutions whether they are or are not in-residence at NIMBioS.

5. *Initiating new tutorials*. The Board was requested to consider topics appropriate for new tutorials and several potential areas were considered, including making further connections to other major funded projects such as NEON and the Virtual Cell project, which might benefit from a collaboration in which NIMBioS hosted tutorials focused on the mathematical issues arising from these projects.

6. *Post-doc mentoring plan*. A draft of this plan was discussed by the Board and approved.

7. *New visiting graduate fellows program*. The objectives of this new program were discussed with the Board and suggestions were solicited regarding how it might best be publicized and described, assuming there were funds in the renewal award to support it.

8. *Director search*. The status of the search for a new NIMBioS Director was presented and suggestions were solicited of individuals who should be approached to apply.

Agenda:

Thursday October 11th

8:00 - 8:50	Breakfast
8:50 - 9:10	Tour of the new NIMBioS facilities
9:10 - 9:30	Introductions
9:30 - 10:45	Review of requests for support
10:45- 11:00	Break
11:00- 12:30	Review of requests for support (cont.)
12:30- 1:30	Lunch
1:30 - 3:00	Planning for NIMBioS renewal (discussion of site review, NIMBioS response, and the renewal proposal)
3:00 - 3:30	Discussion of methods to improve topical diversity in NIMBioS activities
3:30 - 3:45	Break
3:45 - 4:00	Formation of standing committees (Committee to Promote Diversity, Leadership Evaluation Committee)
4:00 - 4:30	Discussion of post-doc mentoring plan
4:30 - 5:00	Discussion of new Visiting Graduate Fellows program
5:30 - 6:30	Reception

Friday October 12th

8:00 - 9:30	Breakfast meetings with NIMBioS post-docs
9:30 - 10:15	Revising the NIMBioS strategic plan
10:15 - 10:30	Process for expanding the Advisory Board
10:30 - 10:45	Break
10:45 - 11:15	Search for new Director (process, candidates, announcements)
11:15 - 12:00	Wrap up
12:00 -	Lunch

NIMBioS Board of Advisors Virtual Meeting held January 28, 2013

This meeting reviewed postdoctoral applicants from the December 2012 call for requests for support. Thirteen Board members participated along with the NIMBioS Leadership Team. Board members who were not able to participate provided comments and recommendations prior to the meeting. Applications were received from 46 individuals, and 20 were submitted to the Board for review. The Board noted that the quality and quantity of the pool were very high and recommended support for seven applicants.

NIMBioS Board of Advisors Virtual Meeting held April 1, 2013

This meeting reviewed applications for Working Groups, Investigative Workshops and Sabbatical Fellows from the March 2013 call for requests for support. Fourteen Board members participated in the meeting along with the NIMBioS Leadership Team. Board members who were not able to participate provided comments and recommendations prior to the meeting.   Requests for support for four Working Groups, four Investigative Workshops, and three Sabbatical Fellows were evaluated.   The Board recommended support for one working group and support pending acceptable revisions for the other three. Three Investigative Workshops were recommended for support with one denied but encouraged to resubmit. One Sabbatical Fellow was recommended for support, one was recommended pending acceptable revisions, and one was denied.

Addendum to NIMBioS Annual Report

Sep 1, 2012 –Aug 31, 2013

Y5-2. NIMBioS Evaluation Report

NIMBıoS EVALUATION REPORT

REPORTING PERIOD FIVE
SEPTEMBER 1, 2012-MAY 31, 2013

NATIONAL INSTITUTE FOR MATHEMATICAL AND BIOLOGICAL SYNTHESIS
JUNE 2013

CONTENTS

NIMBIOS EVALUATION REPORT, REPORTING PERIOD FIVE

INTRODUCTION

This is an evaluation summary of NIMBioS activities during the fifth annual reporting period (RP 5) to the National Science Foundation. This report covers the period of September 1, 2012-May 31, 2013. The NIMBioS evaluation program follows the CIPP systems approach, which is based upon the premise that the most important purpose of evaluation is not to prove, but to improve. The evaluation addresses four main interconnected evaluation types as seen in Figure 1[1]:

Figure 1. The CIPP Model for Evaluation used to guide the NIMBioS evaluation process
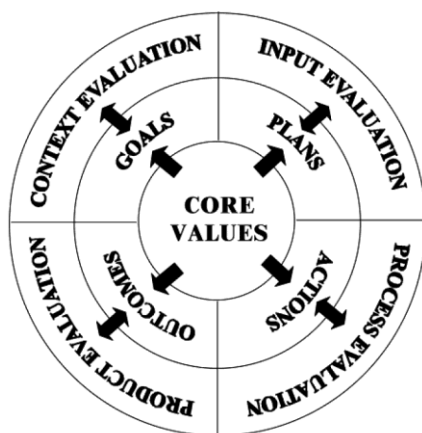
For all parts of the system, the NIMBioS evaluation process is grounded in its core values of (1) taking a collaborative approach to science and science education, and (2) increasing the diversity of researchers and educators at the interface of mathematics and biology.

CONTEXT (GOALS)

Context is not a specific phase of the evaluation process, but rather a constant form of evaluation that takes place during the input, process, and product evaluations as NIMBioS seeks to ensure that it is meeting its goals for each part of the system and that those goals are relevant and in line with its core values.

INPUTS

The input evaluation seeks to assess the responsiveness of NIMBioS' inputs to its goals. Specifically, NIMBioS is interested in ensuring that we are continuously maintaining a diverse atmosphere in a number of ways. Data sources for input evaluations include the participant demographic survey and accepted requests for support. At this phase, several goals comprise the context for the input evaluation:

1. NIMBioS participants will represent diverse gender, racial, ethnic, institutional, career, disciplinary, and geographic backgrounds.

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[1] Stufflebeam, D.L. (2003). The CIPP model for evaluation. In T. Kelleghan & D.L. Stufflebeam (Eds.) *International Handbook of Education Evaluation* (pp. 31-61). London: Kluwer Academic Press.

2. NIMBioS will meet or exceed its participant diversity benchmarks.
3. NIMBioS will support activities across the spectrum of categories of requests for support.
4. NIMBioS will support Working Group and Investigative Workshop requests from a range of discipline areas.

PROCESS

The process evaluation seeks to evaluate congruence between goals and activities. This type of evaluation is situated in monitoring and judging activities at NIMBioS, mainly through periodic evaluative feedback surveys from participants and organizers. Other process evaluation data sources include evaluation case studies which look more closely at what factors of NIMBioS participation contribute to positive changes in participants' research and/or academic careers. Although the context at this phase will differ for different types of NIMBioS events, several overarching goals comprise the context for the process evaluation:

1. Participants will be satisfied with the event/program overall.
2. The event/program will meet participant expectations.
3. Participants will feel the event/program made adequate progress toward its stated goals.
4. Participants will feel they gained knowledge during the event/program.
5. Participants feel that participating in the event/program will have an impact on their future research/academic career.
6. Participants will be satisfied with the accommodations offered by NIMBioS.

PRODUCTS

The products evaluation seeks to monitor, document, and assess the quality and significance of the outcomes of NIMBioS activities. It provides guidance for continuing, modifying, or terminating specific efforts. Data sources for product evaluations include participant self-report of NIMBioS products resulting from affiliation (e.g. journal articles, student education, software), Web of Science data, data collected from participant evaluation forms and follow-up surveys. At this phase, several goals comprise the context for the evaluation:

1. NIMBioS publications will be highly interdisciplinary.
2. NIMBioS publications will be highly cited.
3. NIMBioS publications will highly collaborative.
4. NIMBioS participants will produce other scholarly products, including book chapters, presentations, proposals for follow-on research, meetings/Workshops, student education, data/software, and/or publicity in other media.

INPUT EVALUATION

The input evaluation seeks to assess the responsiveness of NIMBioS' inputs to its goals. Specifically, NIMBioS is interested in ensuring that it is continuously maintaining a diverse atmosphere in a number of ways. Data sources for input evaluations include the participant demographic survey and accepted requests for support.

CONTEXT

1. NIMBioS participants will represent diverse gender, racial, ethnic, institutional, career, disciplinary, and geographic backgrounds.
2. NIMBioS will meet or exceed its participant diversity benchmarks.
3. NIMBioS will support activities across the spectrum of categories of requests for support.
4. NIMBioS will support Working Group and Investigative Workshop requests from a range of discipline areas.

SUMMARY OF ACTIVITIES

Research program activities during RP 5 included:
- 17 Working Group meetings
- 2 Tutorials
- 1 Investigative Workshop
- 30 Short-term visitors
- 18 Postdoctoral Fellows
- 34 Postdoctoral Fellow Mentorships
- 3 Sabbatical Fellows
- 6 Graduate Research Assistantships

Education and Outreach program activities during RP 5 included (see Annual Report for more details on these events):
- A NIMBioS Seminar Series
- Biology in a Box Program
- Research Experiences for Undergraduates Program
- Undergraduate Research Conference at the Interface of Biology and Mathematics
- Teacher Collaboration Program

Other events included:
- 3 Advisory Board Meetings

DIVERSITY OF RESEARCH ACTIVITIES

NIMBioS is interested in supporting research activities from diverse subject areas. Working Group and Workshop Organizers are asked to categorize their proposed events into preselected research categories to help NIMBioS leadership ensure that a broad range of research areas are covered. Figure 2 shows the diversity of subject areas associated with NIMBioS Working Groups and Investigative Workshops during RP 5 (each supported event may have up to three subject areas).

Figure 2. Diversity of Subject Areas of Working Groups and Investigative Workshops, RP 5
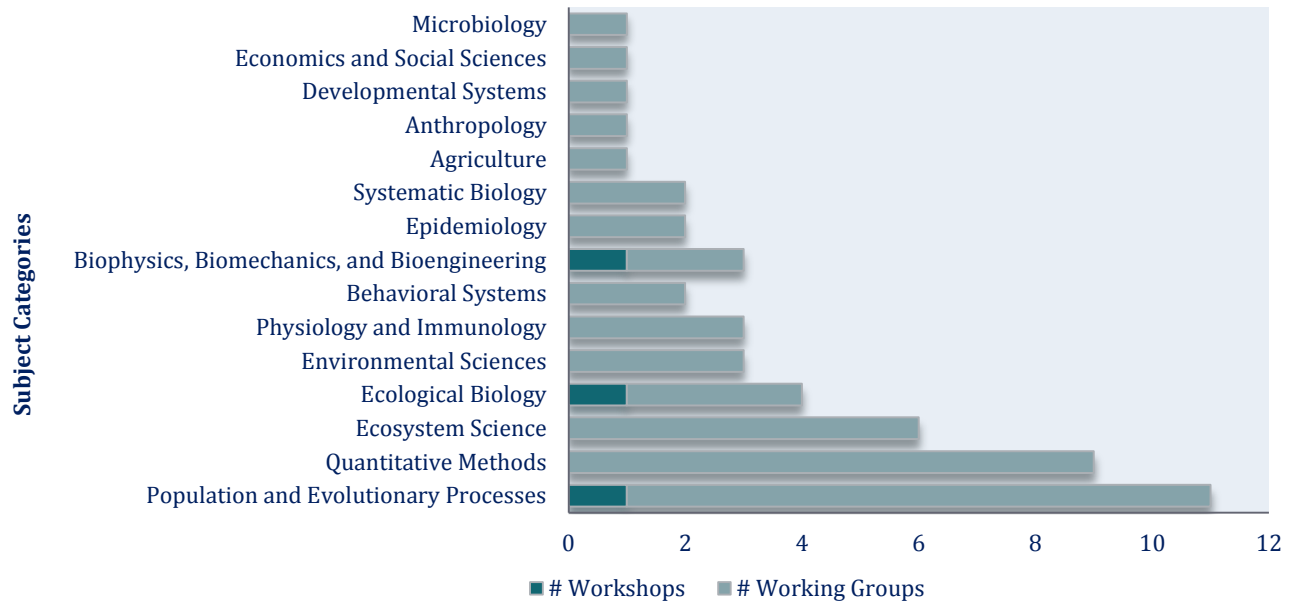
DIVERSITY OF PARTICIPANTS

One of the core values of NIMBioS is to increase the diversity of researchers and educators at the interface of mathematics and biology. NIMBioS collects voluntary demographic data from event applicants to gauge whether our program is fairly reaching and benefitting everyone regardless of demographic category and to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities, and to assess involvement of international participants in the program. An electronic demographic survey aligned to the reporting requirements of the National Science Foundation was sent to all participants before their arrival at NIMBioS. Four weeks before the date of each event, a link to the survey was sent to each participant who had not visited NIMBioS within the last year. Reminder emails were sent to non-responding participants at one and two weeks after the initial contact date. The overall response rate for the demographic survey during RP 5 was 94%. Demographic questions regarding gender, race, ethnicity, and disability status were optional. When feasible, the evaluation staff supplied missing demographic data from other sources (e.g. institution, primary field of study). The evaluation staff 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 5, a total of 545 participants (428 different individuals) from 23 countries participated in NIMBioS events.   Most participants came from the United States (86%), the United Kingdom (3%), and Canada (2%) (Figure 3).

Figure 3. NIMBioS RP 5 Participants by Country
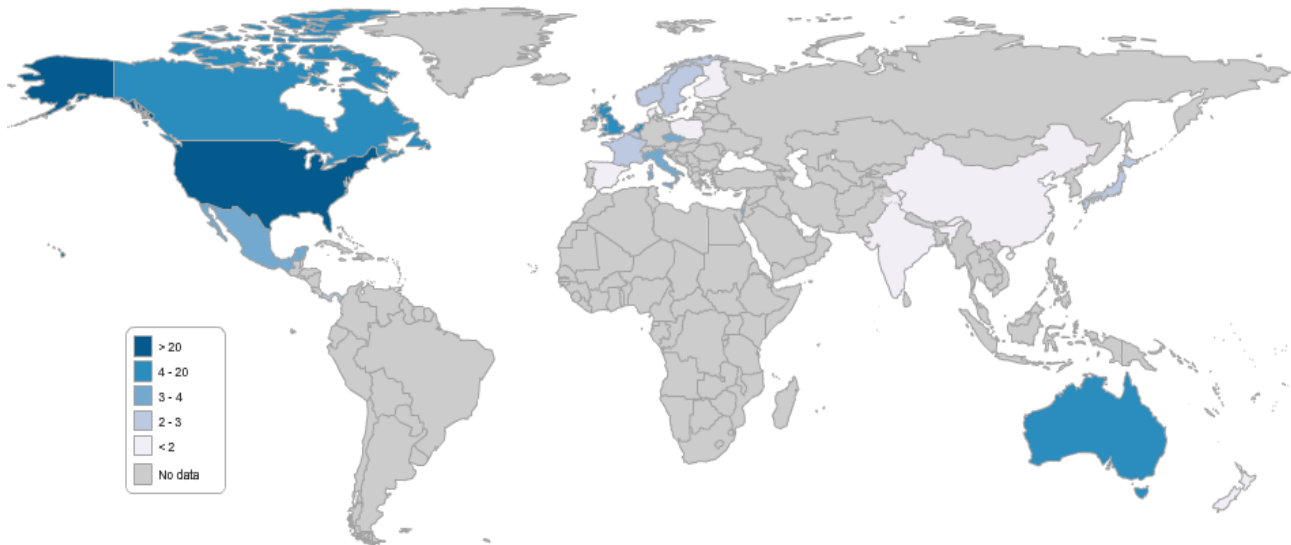
Within the U.S., 41 different states were represented, as well as the District of Columbia and Puerto Rico. The largest percentage of participants came from within Tennessee (31%), followed by California (6%), Georgia (4%), North Carolina (4%), New York (4%), and Texas (4%), and Kentucky (4%) (Figure 4).

Figure 4. NIMBioS RP 5 Participants by U.S. State*
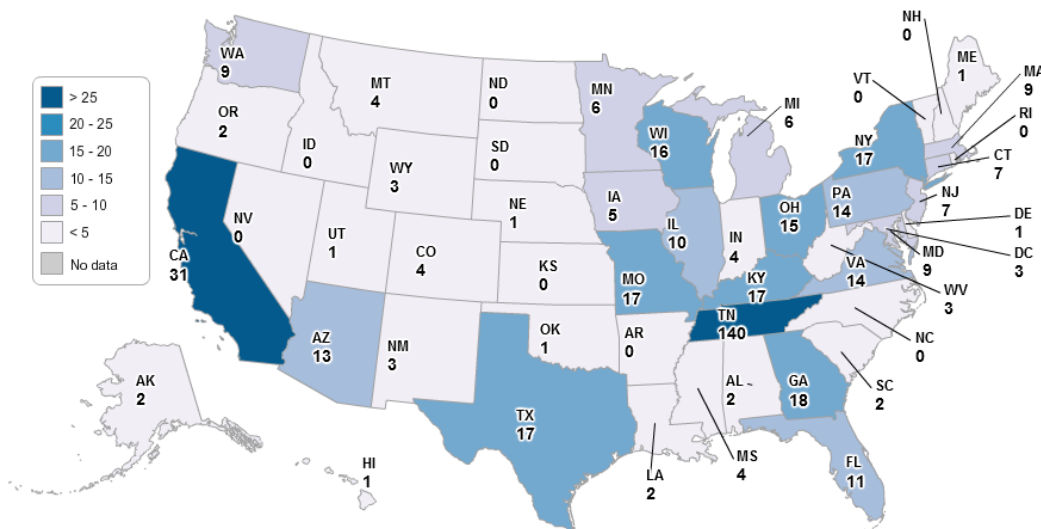
*Not shown, District of Columbia (3), Puerto Rico (2)

GENDER, RACIAL, AND ETHNIC DIVERSITY

Across all events during RP 5, the gender ratio was 61% male to 39% female. Within specific activity types, the gender ratio varied slightly, with the greatest gender equity seen in Tutorial activities (Figure 5). Two comparison groups shown are all individuals receiving doctorates in biology and mathematics in the U.S. in 2011[2]. The distribution of females in NIMBioS activities falls within the range of practicing Ph.D.'s in biology and mathematics in the U.S.

Figure 5. Gender composition of participants by event type
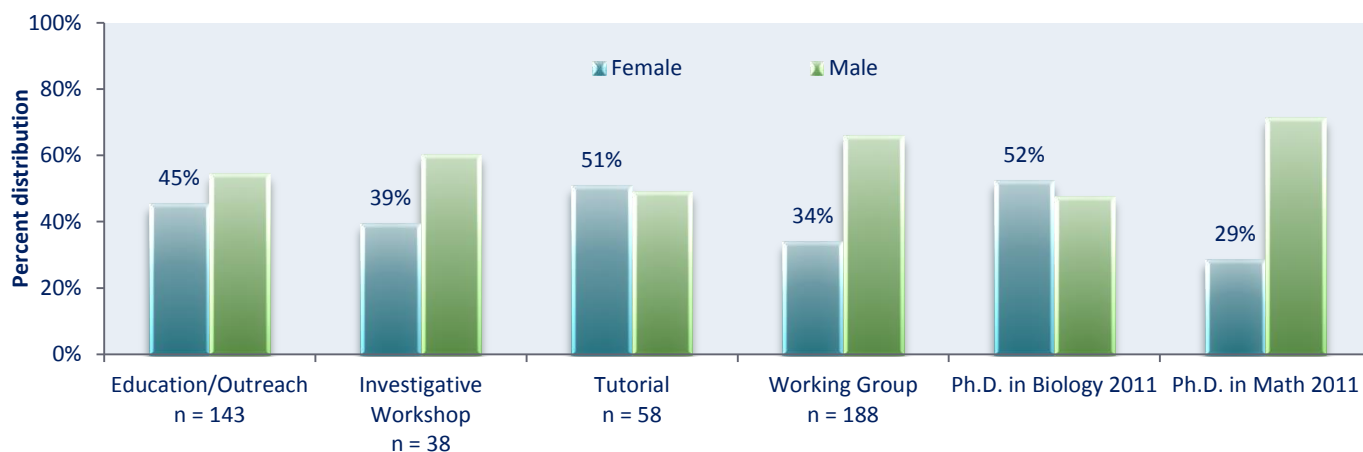
Overall minority representation[3] during RP 5 was around 11%. Representation of various minority categories was on par with current trends in minority representation for doctorial recipients in the biological sciences, and greater than that in the mathematical sciences (Figure 6). Two comparison groups shown are all individuals receiving doctorates in biology and mathematics in the U.S. in 2011[4].

Figure 6. Minority representation of NIMBioS participants (n = 545)
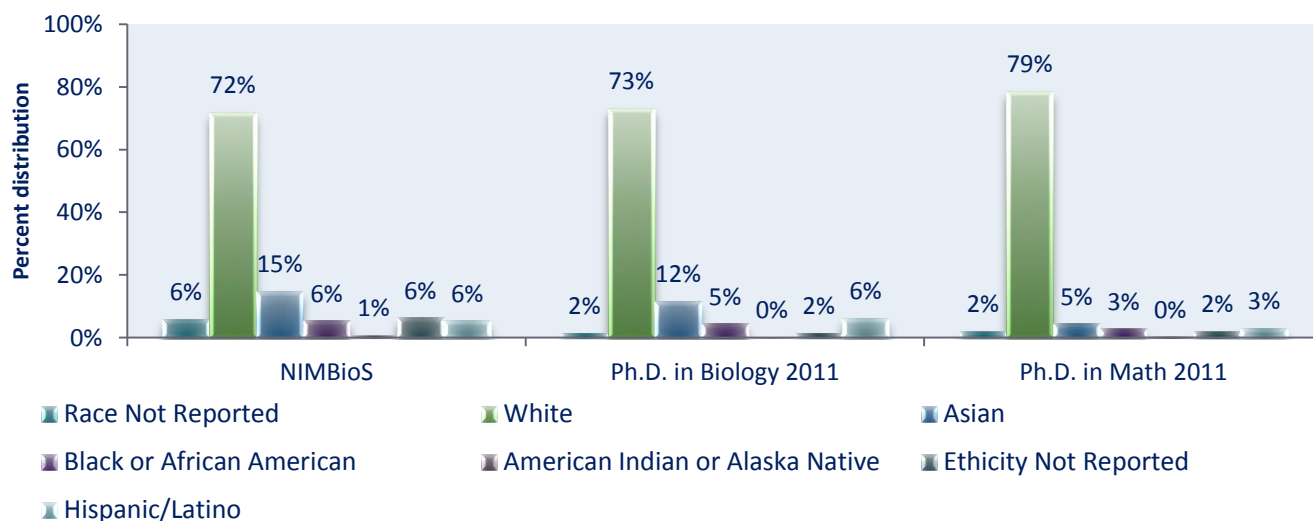
Minority representation varied considerably among programs. By event, Tutorials showed the greatest percentage of Hispanic/Latino participants (9%). Among the different event types, participants self-identifying racially as white were always in the majority. Black or African American participants were represented most strongly in Tutorials (10%) and Education/Outreach Events (8%), while American Indian/Alaska Native individuals were only represented in the Working Group program (2%) (Figure 7).

Figure 7. Minority representation of participants, by event type (n = 545)
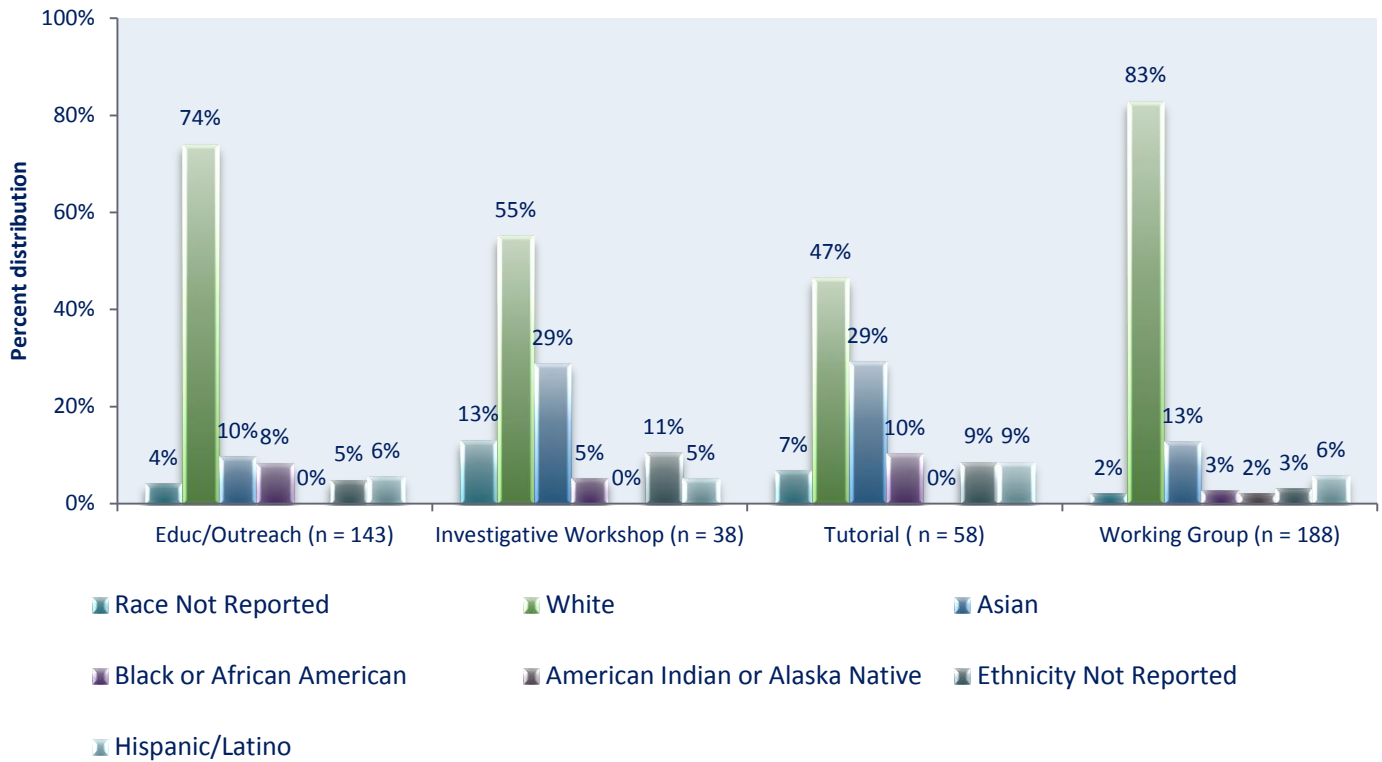
DIVERSITY BENCHMARKS

As per the suggestion of the Site Review carried out at NIMBioS in June 2010, the NIMBioS Leadership Team has consulted with the NIMBioS Advisory Board in response to the recommendation by the Site Review that we establish a variety of benchmarks for our programs.

The Site Review particularly recommended that benchmarks be developed on participation in Working Groups and Investigative Workshops relative to gender and under-represented groups, and on geographical diversity of participants.

Benchmarks for diversity in participants at NIMBioS activities:

1. Gender: Across all Working Groups and Investigative Workshops, the proportion of female participants will be at least 30%.

2. Geographic - International participation: Across all Working Groups and Investigative Workshops, at least 10% of participants will be from outside the USA.

3. Under-represented groups (overall): Across all NIMBioS activities, we will increase the percent of participants from under-represented groups by approximately 10% per year. [$F(t+1) = 1.1 F(t)$ where $F(t)$ is the proportion of total participants from underrepresented groups in Year t, and $F(t+1)$ is the proportion of total participants from underrepresented groups in Year (t+1)].

4. Underrepresented groups (Working Groups and Investigative Workshops): Comparable to the overall goal for all activities, we aim to increase the proportion of participants from under-represented groups in Working Groups and Investigative Workshops by 10% per year.

5. Local participants: To avoid overrepresentation of the University of Tennessee community in activities, we will limit participation by UT/ORNL faculty/staff to approximately 15% of the total participants in Working Groups and Investigative Workshops.

Benchmarks for diversity in activity organizers:

1. Gender: Across all Working Groups and Investigative Workshops, approximately 30% of the organizers will be female.

2. Local: No more than 25% of Working Group/Investigative Workshop organizers will be UT faculty/staff.

3. Underrepresented groups: We will encourage researchers from underrepresented groups to be organizers/co-organizers of requests for support, but no specific goal is set because of the small number of organizers.

Table 1 shows values by year for the above benchmarks.

Table 1. Diversity measures for NIMBioS Working Groups, Investigative Workshops, and all events (including Tutorials and Education and Outreach activities in addition to Working Groups and Workshops) by year

|		Yr 1*	Yr 2	Yr 3	Yr 4	Yr 5**	Overall
PARTICIPANT DIVERSITY							
Gender	(Benchmark: approximately 30% female)						
	Working Groups	19%	22%	27%	34%	34%	27%
	Investigative Workshops	40%	40%	38%	39%	39%	39%
	All events	37%	42%	38%	39%	39%	39%
International	(Benchmark: approximately 10% outside USA)						
	Working Groups	20%	19%	19%	18%	24%	20%
	Investigative Workshops	10%	22%	21%	19%	5%	15%
	All events	7%	12%	14%	16%	14%	13%
URG	(Benchmark: increase proportion approximately 10% per year)						
	Working Groups	9%	9%	7%	8%	8%	8%
	Investigative Workshops	7%	10%	14%	14%	12%	13%
	All events	9%	11%	12%	12%	12%	11%
Local	(Benchmark: No more than 15% from UT/ORNL)						
	Working Groups	14%	15%	16%	18%	14%	15%
	Investigative Workshops	22%	23%	10%	7%	11%	15%
	All events	35%	20%	16%	13%	16%	20%
ORGANIZER DIVERSITY							
Gender	(Benchmark: approximately 30% female)						
	Working Groups	11%	13%	16%	28%	27%	19%
	Investigative Workshops	25%	29%	38%	39%	0%	26%
	All events	23%	28%	27%	34%	30%	28%
Local	(Benchmark: No more than 25% UT Faculty/Staff)						
	Working Groups	28%	22%	20%	28%	21%	24%
	Investigative Workshops	75%	36%	12%	17%	0%	28%
	All events	57%	42%	33%	27%	21%	36%

*Year 1 includes activities from March-August 2009

** Year 5 includes activities from September-May 2013; only one Workshop took place during RP 5

DISABILITY STATUS

Disclosure of disability status by participants to NIMBioS is optional. Around 5% overall indicated having some sort of disability during RP 5. Nearly 4% indicated having some sort of visual impairment, while nearly 3% indicated having a hearing or mobility impairment (Figure 8).

Figure 8. Disability status of participants (n = 545)
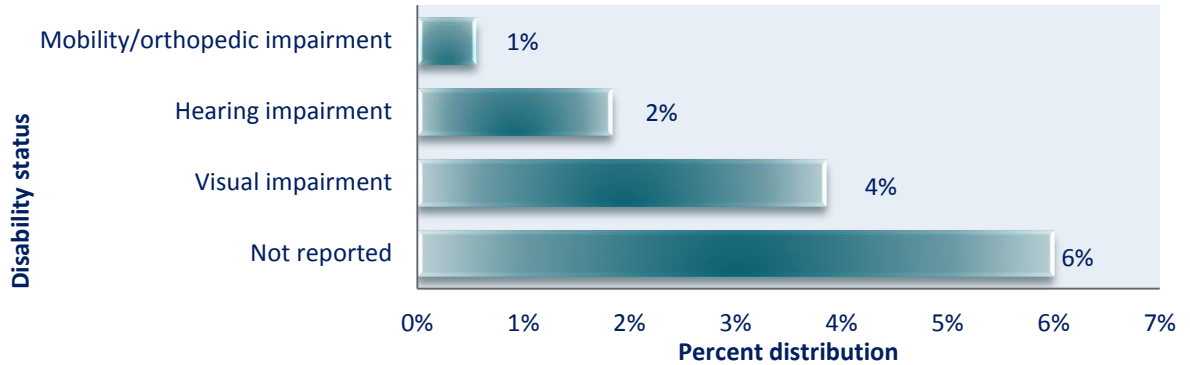

INSTITUTIONAL AND DISCIPLINARY DIVERSITY

The majority of NIMBioS participants were college/university faculty or staff, undergraduate students, or postdoctoral researchers; however, participants came from government, non-profit, or other positions as well (Figure 9).

Figure 9. Employment status of participants (n = 545)
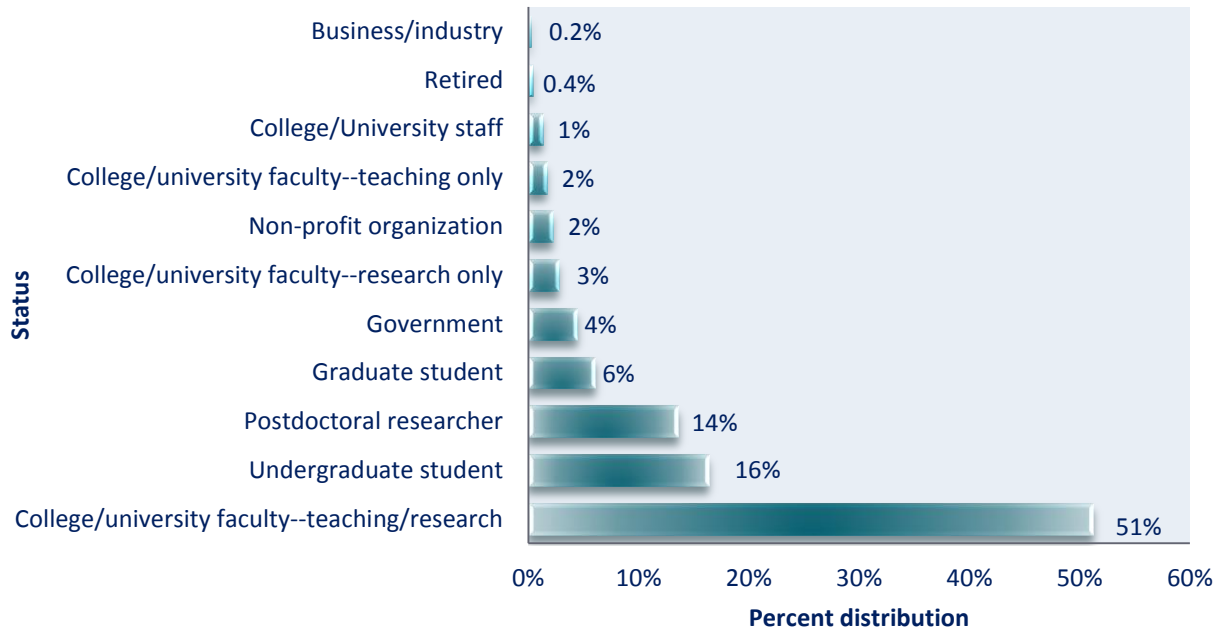
Most participants at NIMBioS indicated their primary fields of study, as well as areas of concentration within those fields. Many indicated their secondary and tertiary fields of study as well. The most commonly reported fields of study included biological/biomedical sciences, mathematics, and social sciences, although many other disciplines were represented (Figure 10).

Figure 10. Primary, secondary, and tertiary discipline areas of participants
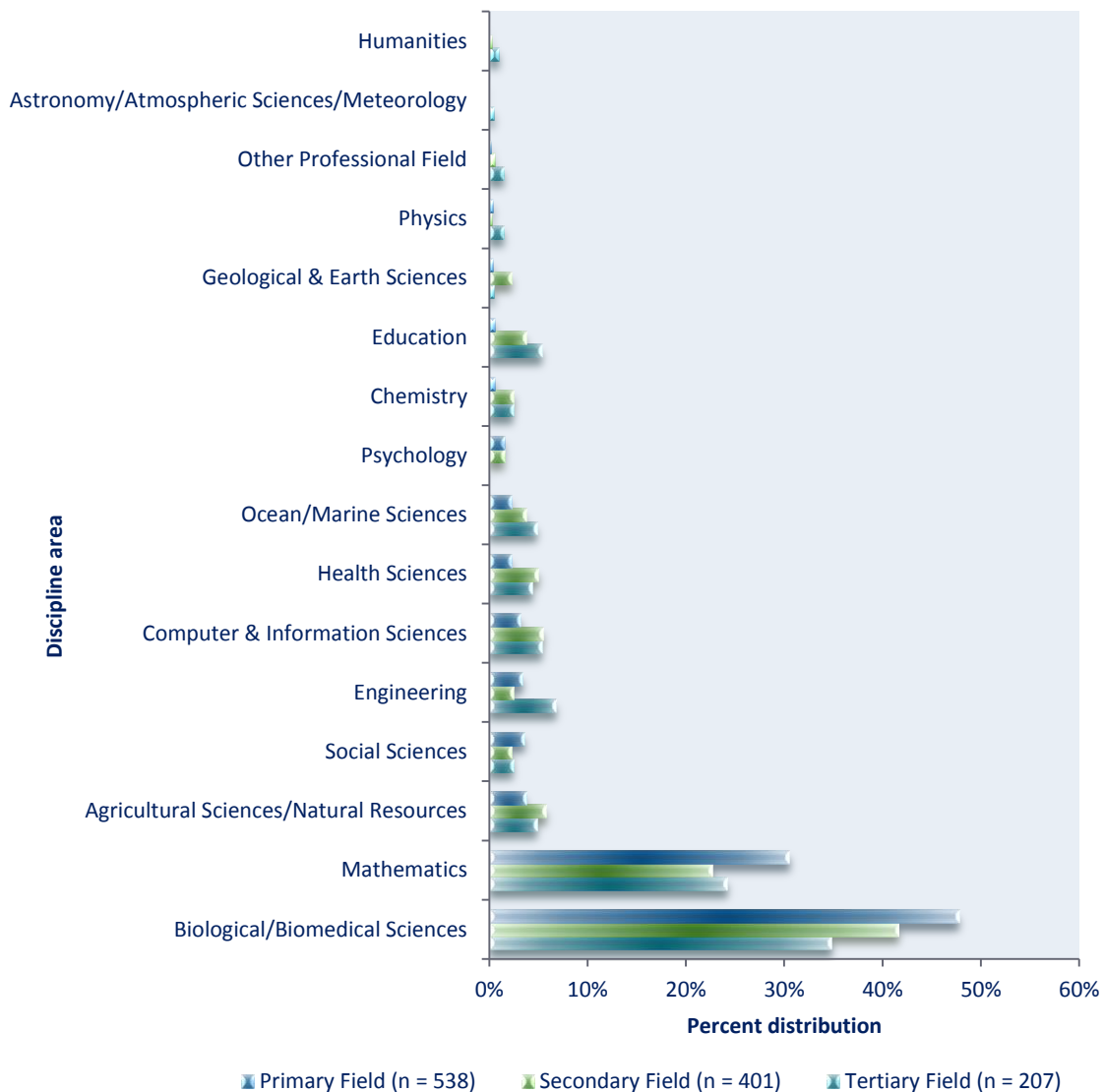
The 257 participants naming Biological/Biomedical Sciences as their primary field of study indicated 25 different areas of concentration within which they would classify their primary areas of research/expertise. The most commonly indicated area of concentration was ecology (28%), followed by evolutionary biology (21%) and mathematical biology (12%) (Figure 11).

Figure 11. Participant research/expertise area concentrations within biological/biomedical sciences field of study (n = 257)
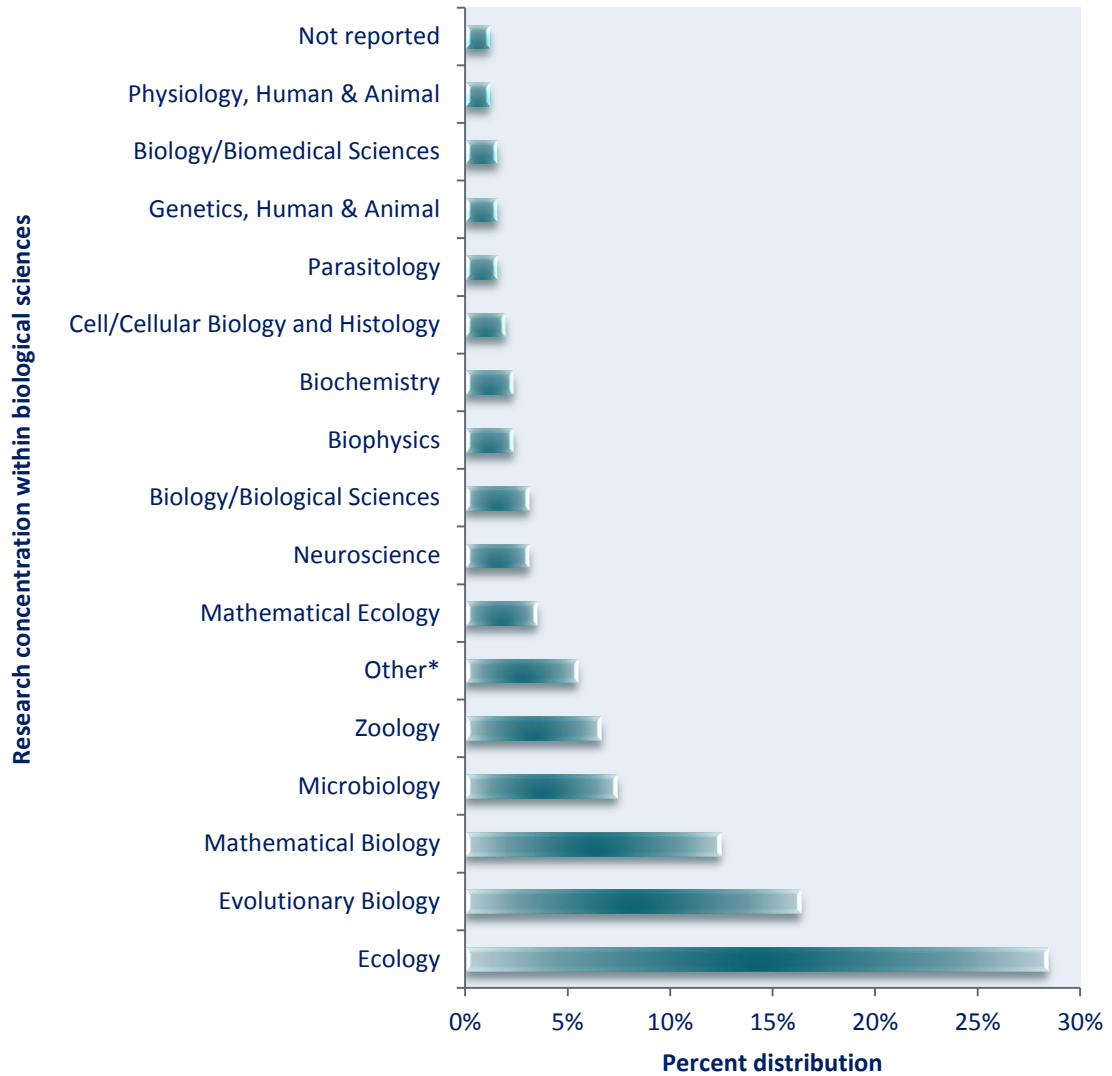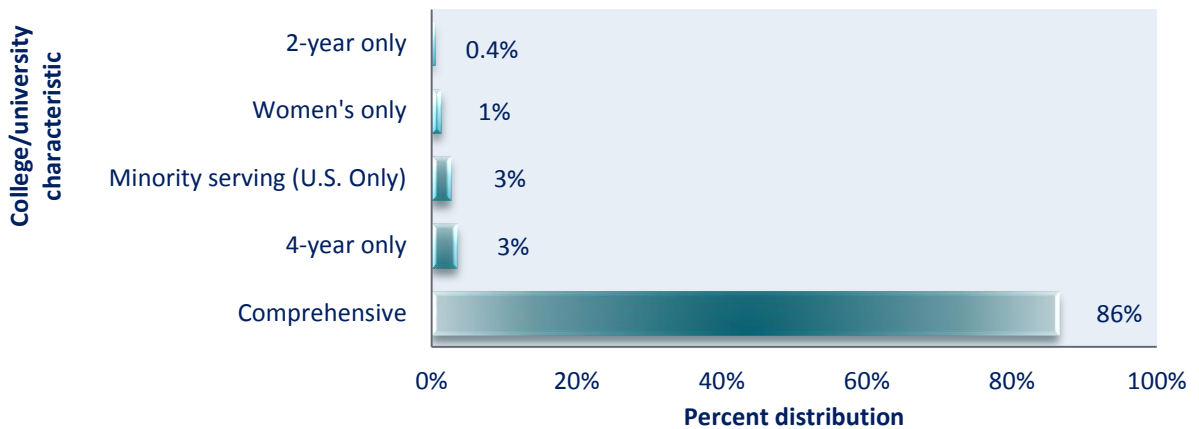

* Other concentrations having fewer than 1% of participants each: Anatomy, Immunology, Biology, Molecular Biology, Behavioral Ecology, Biometrics & Biostatistics, Bacteriology, Botany/Plant Biology, Plant Genetics, an Developmental Biology/Embryology.

Participants during RP 5 represented 204 different institutions, including colleges and universities, government institutions, private businesses, non-profits, and high schools (Figure 12). Of the colleges/universities represented, most were classified as comprehensive (having undergraduate and graduate programs) (Figure 13).

Figure 12. Types of institutions represented (n = 204)

College/university
92%

Business/industry
1%

Non-profit
2%

Federal Government
5%
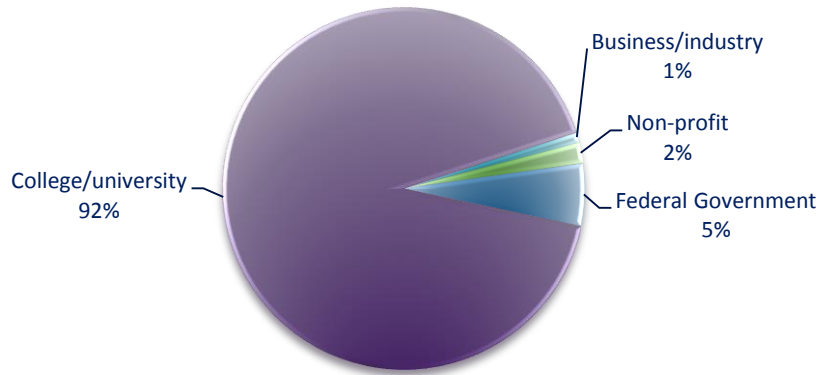
Figure 13. Characteristics of participants' colleges/universities

College/university characteristic

2-year only — 0.4%
Women's only — 1%
Minority serving (U.S. Only) — 3%
4-year only — 3%
Comprehensive — 86%

Percent distribution

PROCESS EVALUATION

The process evaluation seeks to evaluate congruence between activities and goals. This type of evaluation is situated in monitoring and judging activities at NIMBioS, mainly through periodic evaluative feedback surveys from participants and event organizers. Other process evaluation data sources include evaluation case studies which look more closely at what factors of NIMBioS participation contribute to positive changes in participants' research and/or educational careers.

NIMBioS conducted formal process evaluations of its first and last Working Group meetings, Investigative Workshops, Undergraduate Research Conference at the Interface of Biology and Mathematics, Postdoctoral Fellowship program, and Research Experiences for Undergraduates/Veterinary Students programs. An evaluation of the 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 summary of the process evaluations of NIMBioS' major activities during RP 5.

Process Evaluation of Research Program Activities

Working Group and Tutorial evaluation highlights are aggregated across all events in their respective categories.

CONTEXT

1. Participants will be satisfied with the event overall.
2. The event will meet participant expectations.
3. Participants will feel the group made adequate progress toward its stated goals.
4. Participants will feel they gained knowledge about the main issues related to the research problem.
5. Participants will feel they gained a better understanding of the research across disciplines related to the group's research problem.
6. Participants feel that participating in the event will have on their future research.
7. Participants will be satisfied with the accommodations offered by NIMBioS.

WORKING GROUPS

NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics that require insights from diverse researchers. The questions to be addressed may be either fundamental, applied or both, and may be focused around a particular biological topic, or one from mathematics that is driven by biological insight. NIMBioS is particularly interested in questions that integrate diverse fields, require synthesis at multiple scales, and/or make use of or require development of new mathematical/computational approaches.

Working Groups are relatively small (10-12 participants, with a maximum of 15), focus on a well-defined topic and have well-defined goals and metrics of success (e.g., publications, databases, software). Selection of Working Groups is based upon the potential scientific impact and inclusion of participants with a diversity of backgrounds and expertise that match the scientific needs of the effort. Organizers are responsible for identifying and

confirming participants with demonstrated accomplishments and skills to contribute to the Working Group. Given this emphasis, Working Group activities rarely involve recently-trained researchers such as postdocs and graduate students. Participation by international researchers is encouraged; though generally there will not be more than 2-3 individuals from outside North America in a Working Group. Working Groups typically meet 2-4 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. Plans can include visits to NIMBioS for subsets of Working Group members to collaborate with NIMBioS IT staff and researchers on Working Group needs.

WORKING GROUP SUMMARY, RP 5

During RP 5, NIMBioS hosted a total of 17 Working Group meetings, including the start of four new groups. In addition to these new groups, RP 5 saw the return of 10 established groups, two of which met twice during the reporting period. A total of 199 participants from 103 institutions took part in the Working Groups. During RP 5, participants came together from 11 different major fields of study to focus on the respective scientific questions of their groups. Figure 14 shows the cross-disciplinary connections fostered among Working Group members through the meetings hosted at NIMBioS. Node radius is representative of the log scaled number of participants in each field of study. Line size is representative of the number of times researchers from each field were brought together to collaborate and problem-solve at NIMBioS.

Figure 14. Working Group cross-disciplinary collaboration
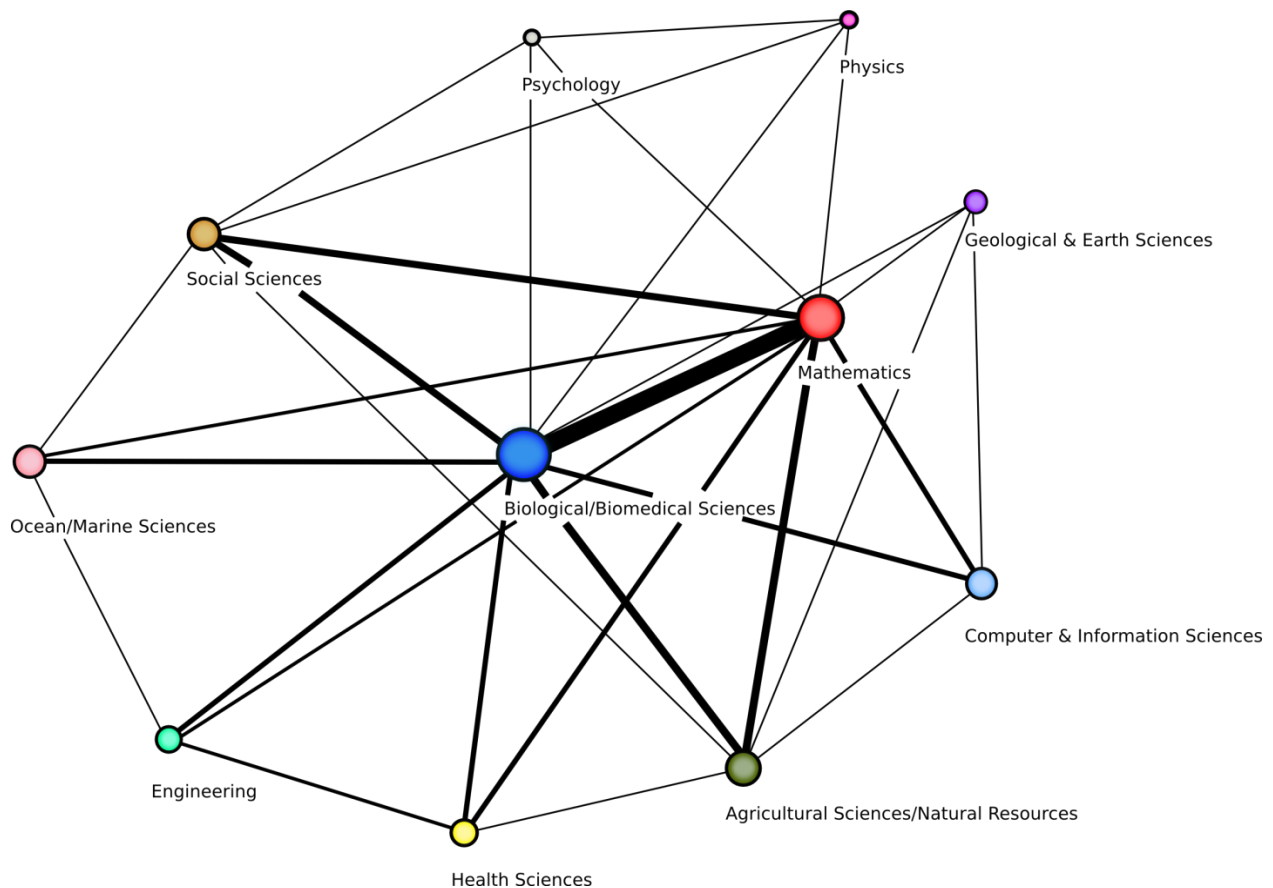
ORGANIZER FEEDBACK

Beginning in November 2011, NIMBioS began collecting satisfaction feedback from Working Group, organizers to the following question: As an event organizer, how satisfied were you overall with the way your event was managed by NIMBioS (from the application process through the wrap-up of the event)? Figure 15 summarizes the responses to this question for RP 5 organizers of beginning Working Groups.

Figure 15. Working group organizer satisfaction with NIMBioS handling of event (n = 11)
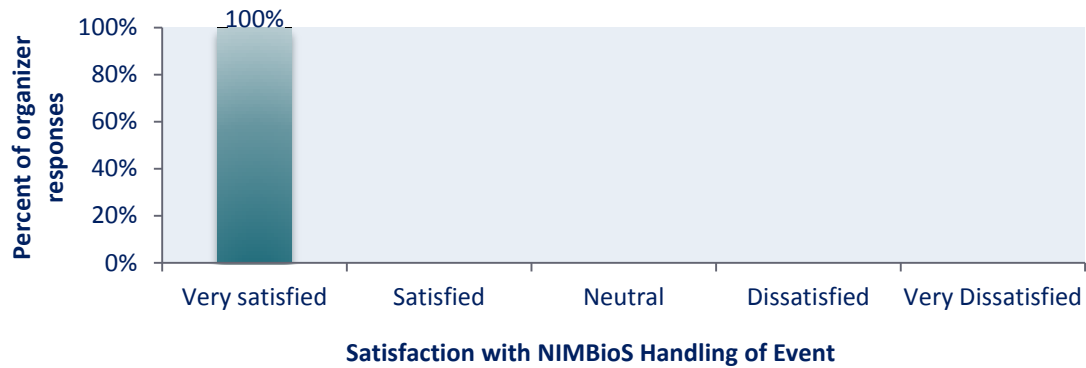
FIRST MEETINGS

During RP 5, NIMBioS hosted the first meetings of four Working Groups, with a total of 52 participants (

Table 2) (See http://www.nimbios.org/workinggroups/ for more details about specific Working Groups). Evaluation surveys were sent to all participants. A total of 41 participants took part in the evaluation of the first meetings of their Working Groups. Eleven of these participants were organizers and only answered questions about how they well they felt NIMBioS managed their events.

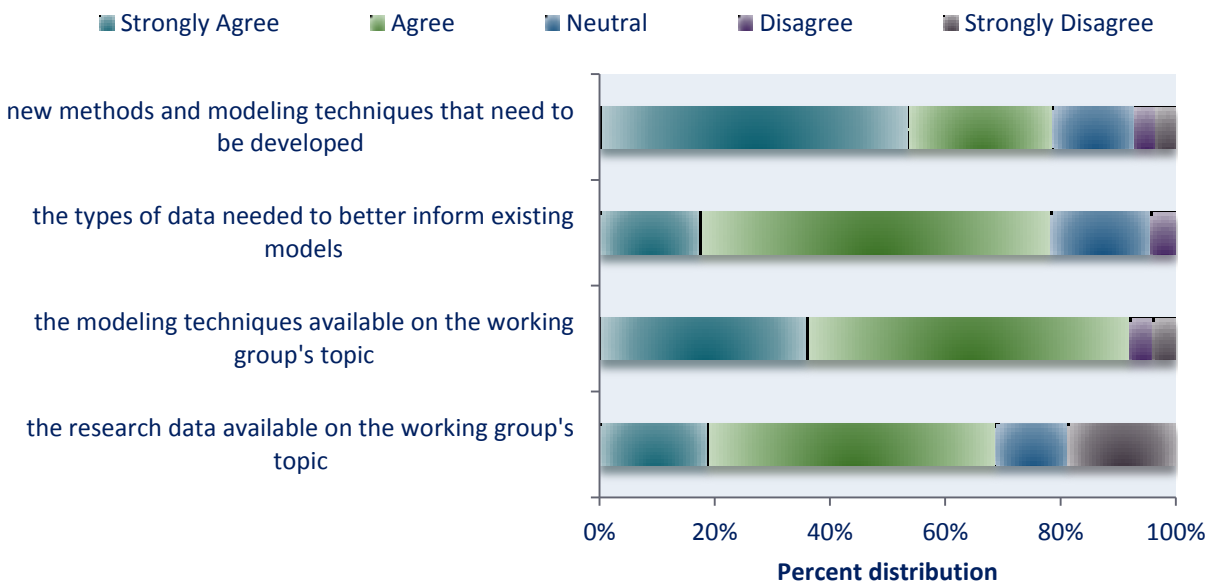**Table 2. *Working Group First Meetings Hosted by NIMBioS***

Title of Working Group	Dates	# Participants
Biotic Interactions	Feb 1-4, 2013	14
Hierarchy and Leadership	Apr 25-27, 2013	12
Design and Analysis of Bat Population Monitoring	May 7-9, 2013	17
Nonautonomous Systems and Terrestrial C-cycle	May 13-17, 2013	9

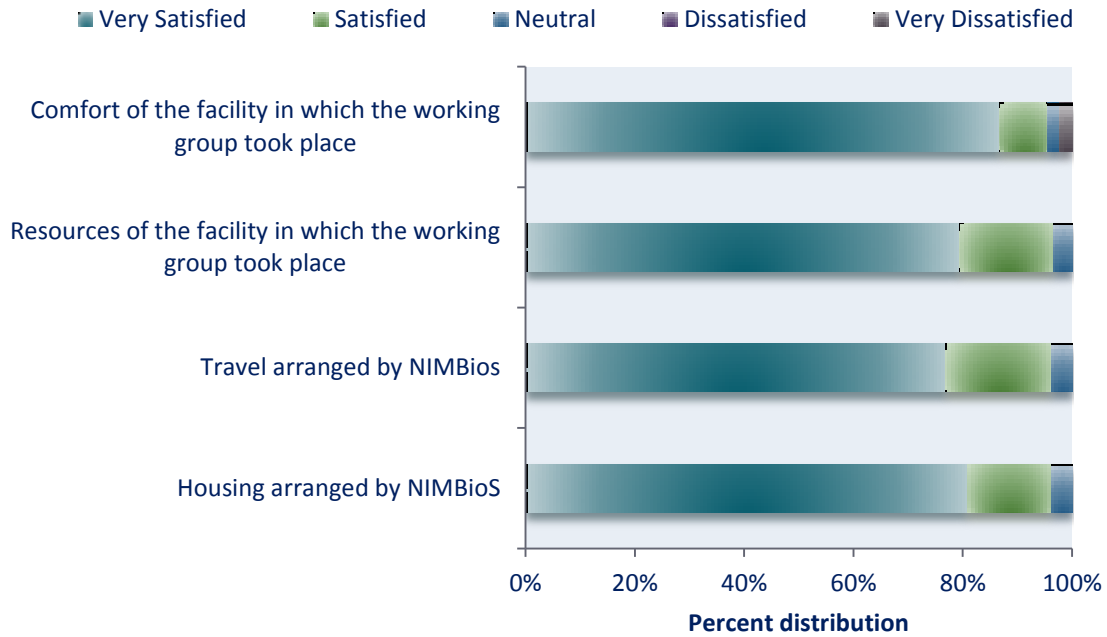**SUMMARY OF WORKING GROUP FIRST MEETING EVALUATION RESPONSES**

Figure 16. *Overall satisfaction with the content and format of the Working Groups*
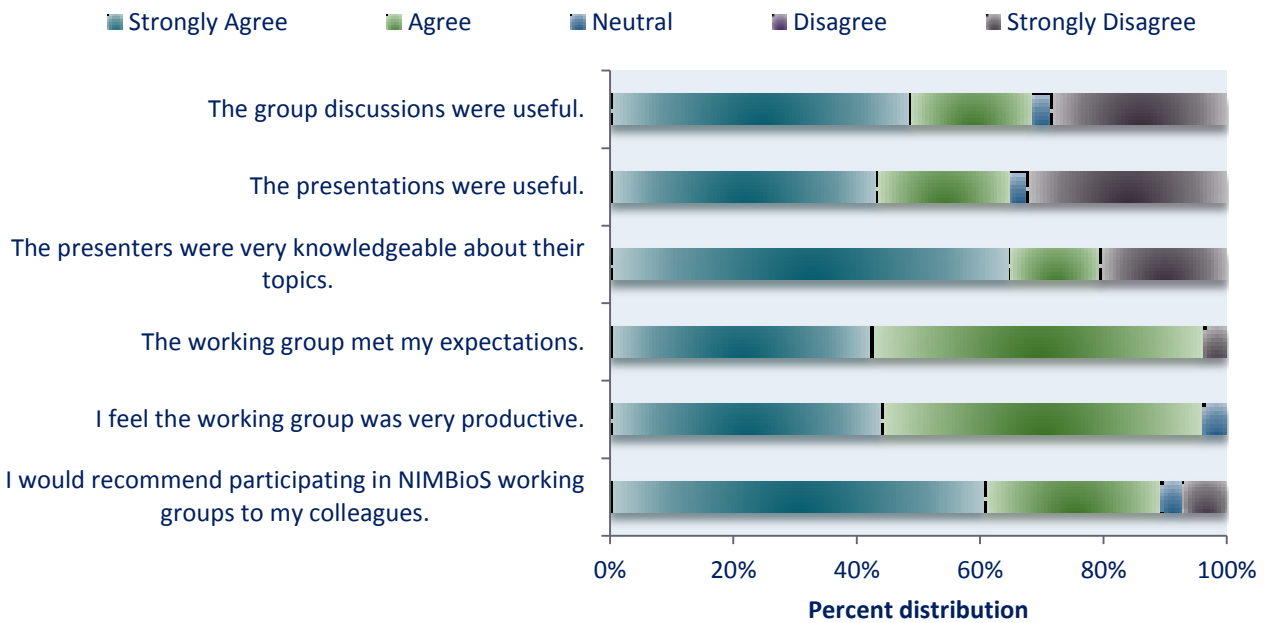
Figure 17. *Participant responses to the following question--As a result of participating in this Working Group, I have a better understanding of:*

Figure 18. *Satisfaction with Working Group accommodations*

Legend: ■ Very Satisfied ■ Satisfied ■ Neutral ■ Dissatisfied ■ Very Dissatisfied

Categories (top to bottom):
- Comfort of the facility in which the working group took place
- Resources of the facility in which the working group took place
- Travel arranged by NIMBios
- Housing arranged by NIMBioS

Percent distribution (0% – 100%)

Figure 19. Percent of participants in first meetings of Working Groups who:

84% — Felt that the exchange of ideas that took place would influence their future research

91% — Felt that participating in the Working Group helped them understand the research happening in other disciplines on the research topic

91% — Developed unanticipated plans for collaborative research with other Working Group participants with whom they had not previously colalborated

WORKING GROUP SECOND, THIRD, AND FOURTH MEETINGS

During the reporting period, NIMBioS hosted the second meetings of five Working Groups, with a total of 60 participants, and the third meeting of seven Working Groups, with a total of 77 participants. One group held its fourth meeting with 10 participants (Table 3). Beginning in March 2011, NIMBioS changed its policy on evaluation of Working Group meetings to only sending full evaluation surveys to participants after the first and final meetings, rather than after every meeting.

Table 3. *Working Group Second and Third Meetings Hosted by NIMBioS*

Title of Working Group	Dates	# Participants
Second Meetings		
Ocean Viral Dynamics	Oct 22-24, 2012	13
Play, Evolution, and Sociality	Oct 29-31, 2012	14
Suction Feeding Biomechanics	Oct 29-30, 2012	10
Modeling Anthrax Exposure	Nov 13-15, 2012	12
Within-host modeling of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) infections	March 4-6, 2013	11
Third Meetings		
Gene Tree/Species Tree Reconciliation	November 26-29, 2012	12
Optimal Control for Agent-based Models	November 27-29, 2012	13
Food Web Dynamics	December 11-12, 2014	8
Multiscale Modeling of the Life Cycle of Toxoplasma gondii	December 17-19, 2012	13
'Pretty Darn Good' Control: extensions of optimal control for ecological systems	Jan 22-24, 2013	11
Modeling Anthrax Exposure	May 15-17, 2013	9
Suction Feeding Biomechanics	May 20-21, 2013	11
Fourth Meetings		
Cross-Topology Registration	May 1-3, 2013	10

CONCLUDING WORKING GROUPS

Toward the end of the reporting period, NIMBioS received notification that four Working Groups had reached their conclusions. It is the policy of NIMBioS to withhold sending the final evaluation survey to Working Group participants until the final meeting summary has been received from Working Group organizers. As NIMBioS is currently awaiting the final reports from these groups the final evaluation survey is still outstanding at the time of this report.

INVESTIGATIVE WORKSHOPS

NIMBioS Investigative Workshops differ from Working Groups in that they focus on a broader topic or set of related topics at the interface of biology and mathematics and have relatively large size (30-40 participants). Workshops attempt to summarize/synthesize the state of the art and identify future directions, and they have potential for leading to one or more future Working Groups. Organizers invite 15-20 key participants, and the remaining 15-20 participants are filled through open application from the scientific community.

NIMBioS hosted one Investigative Workshop during RP 5, **Systems and Synthetic Microbiology**, with a total of 38 participants. Evaluation surveys were sent to all Workshop participants. Workshop organizers and NIMBioS employees who were participating in the Workshops were excluded from the evaluation. A total of 35 participants took part in the evaluation of the Workshop.

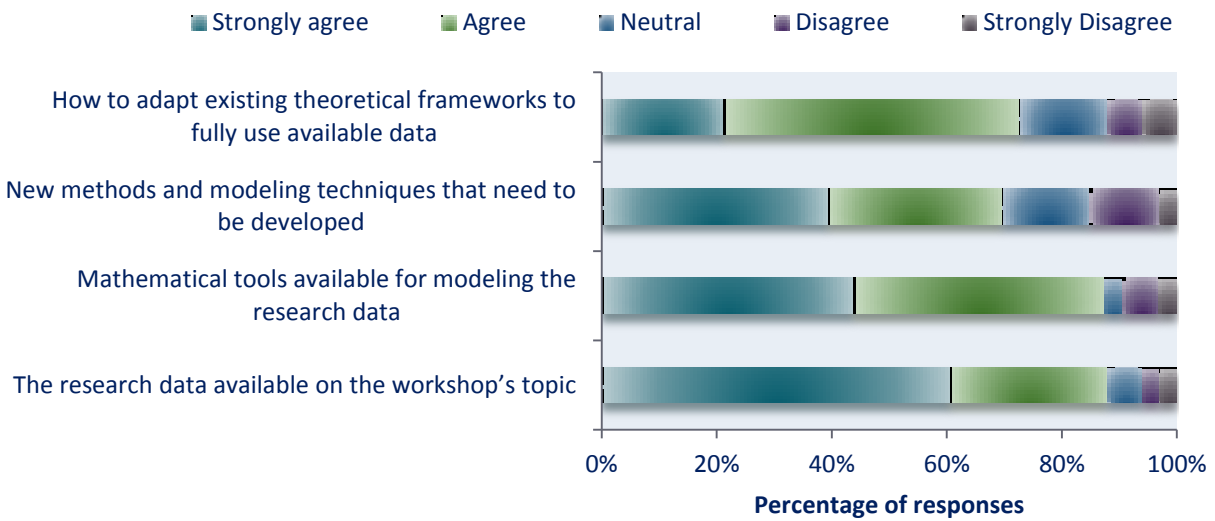**SUMMARY OF WORKSHOP EVALUATION RESPONSES**

Figure 20. Workshop organizer satisfaction with NIMBioS handling of event (n = 2)
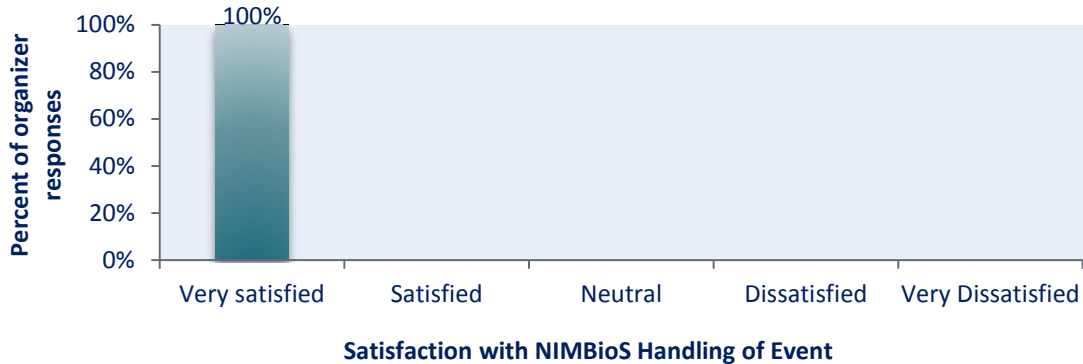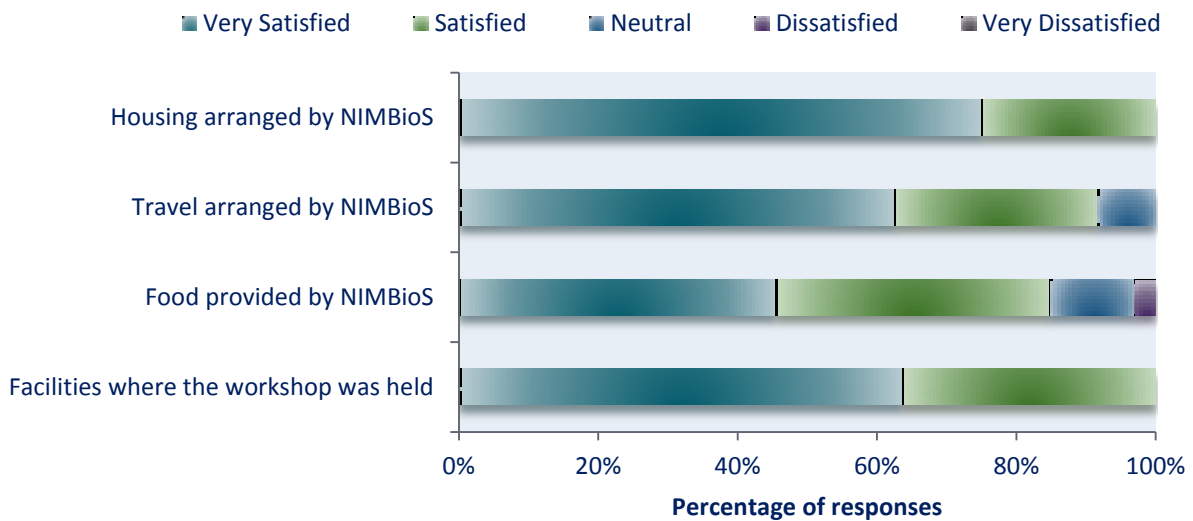

Figure 21. *Overall satisfaction with the content and format of the Workshop*
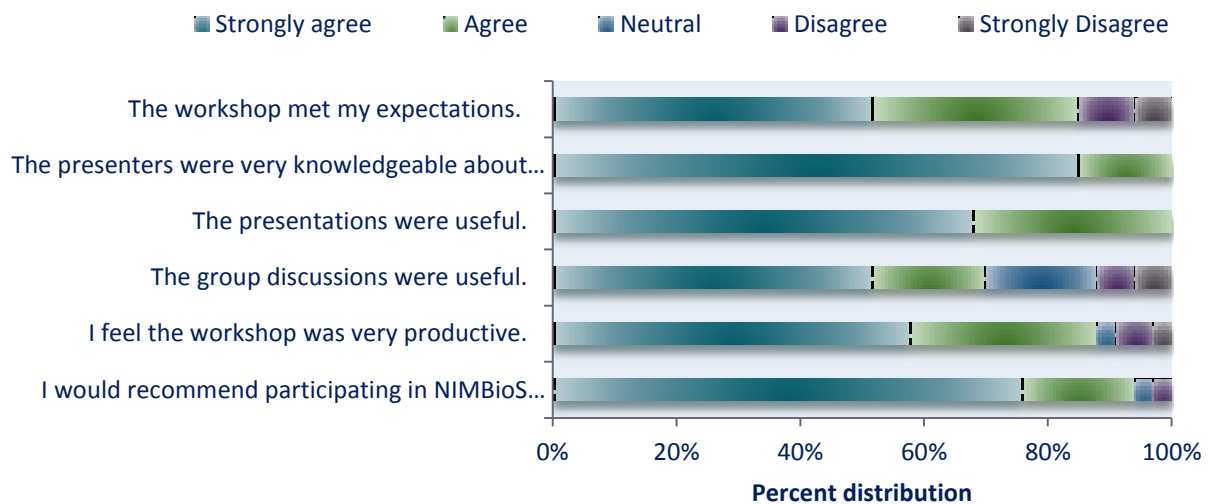
Figure 22. *Participant responses to the following question-- As a result of participating in this Workshop, I have a better understanding of:*

Legend: Strongly agree, Agree, Neutral, Disagree, Strongly Disagree

Categories:
- How to adapt existing theoretical frameworks to fully use available data
- New methods and modeling techniques that need to be developed
- Mathematical tools available for modeling the research data
- The research data available on the workshop's topic

X-axis: Percentage of responses (0% to 100%)

Figure 23. *Satisfaction with Workshop accommodations*

Legend: Very Satisfied, Satisfied, Neutral, Dissatisfied, Very Dissatisfied

Categories:
- Housing arranged by NIMBioS
- Travel arranged by NIMBioS
- Food provided by NIMBioS
- Facilities where the workshop was held

X-axis: Percentage of responses (0% to 100%)

Process Evaluation of Education and Outreach Program Activities

RESEARCH EXPERIENCES FOR UNDERGRADUATES STUDENTS

The NIMBioS *Research Experiences for Undergraduates* (REU) program took place on the University of Tennessee, Knoxville (UT) Knoxville campus June 11–August 3, 2012. Eighteen undergraduates were chosen to participate in the program. (While this REU program technically fell within the dates of reporting period four (RP 4), the REU program for 2013 will not conclude until after the RP 5 annual report is due, so results from the previous year's REU evaluation are provided each year.)

During the eight-week program, participants lived on campus at UT, and worked in teams with UT faculty to conduct research at the interface of mathematics and biology. The award included a stipend, housing and some funding to support travel.

The six research projects for the 2012 program included:

- Modeling the evolution of sexual imprinting,
- Modeling protein translation and genome evolution,
- Harnessing the arsenal of nature: Developing natural pesticides,
- Modeling Salmonella transmission in swine,
- Agent-based mathematical model for Johne's disease epidemiology and economy, and
- Modeling early evolution of human immunodeficiency virus.

Program organizers were Suzanne Lenhart (Dept. Mathematics/NIMBioS), and Kelly Sturner (NIMBioS). Mentors in the program included J.J. Chai (Mathematics, NIMBioS), Shigetoshi Eda (Wildlife Health), Heather Finotti (Mathematics), Vitaly Ganusov (Microbiology), Mike Gilchrist (Evolutionary Bioinformatics), Tucker Gilman (Biology, NIMBioS), Kimberly Gwinn (Plant Pathology), Andrew Kanarek (Biology, NIMBioS), Cristina Lanzas (Veterinary Medicine), Maud Lelu (NIMBioS), Suzanne Lenhart (Mathematics, NIMBioS), Calistus Ngonghala (Mathematics, NIMBioS), Tuoc Phan (Mathematics), Valdimir Protopopescu (Mathematics), and Dan Ryan (Mathematics, NIMBioS).

CONTEXT

1. Participants will be satisfied with the program overall.
2. The research experience will meet participant expectations.
3. The research experience will impact participant plans to go to graduate school.
4. Participants will increase their research skills during the program.
5. Participant will feel they gained knowledge about the research process.
6. Participants will be satisfied with their mentors.
7. Participants will be satisfied with the accommodations offered by NIMBioS.

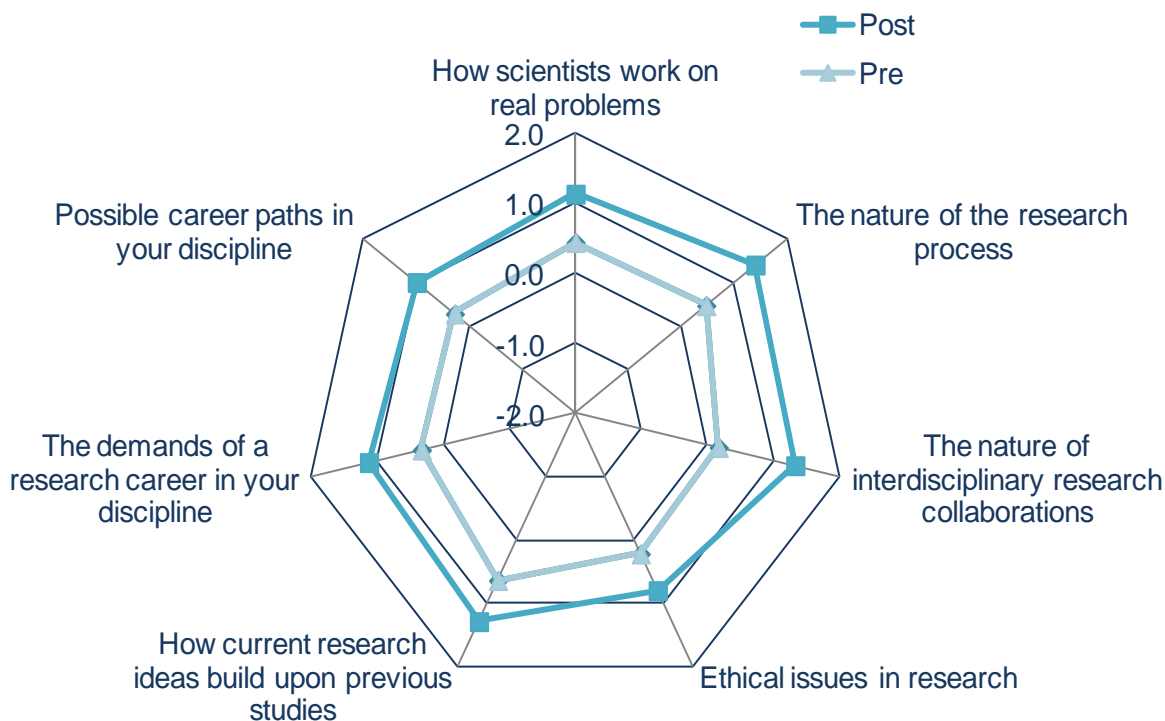**SUMMARY OF REU EVALUATION RESPONSES**

Figure 24. Overall satisfaction with the research experience
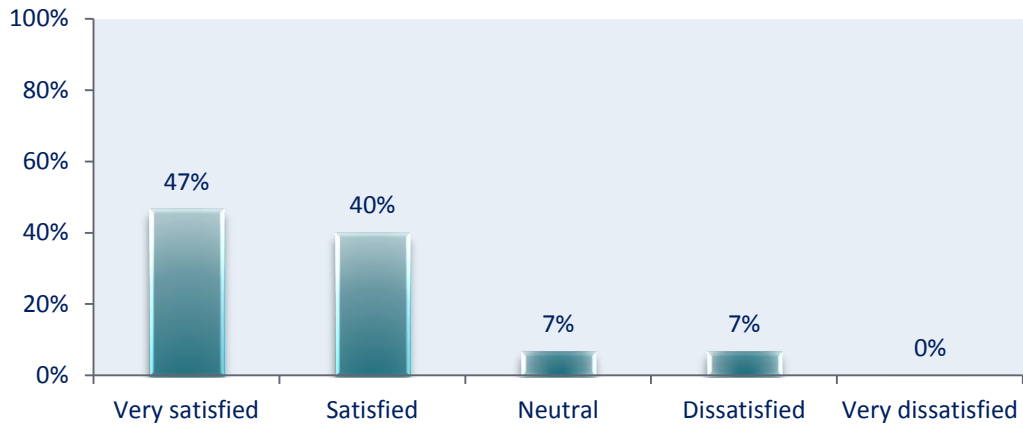
Figure 25. Participant pre-and post-program skills, response scale of -2 = extremely poor at the skill to 2 = excellent at the skill
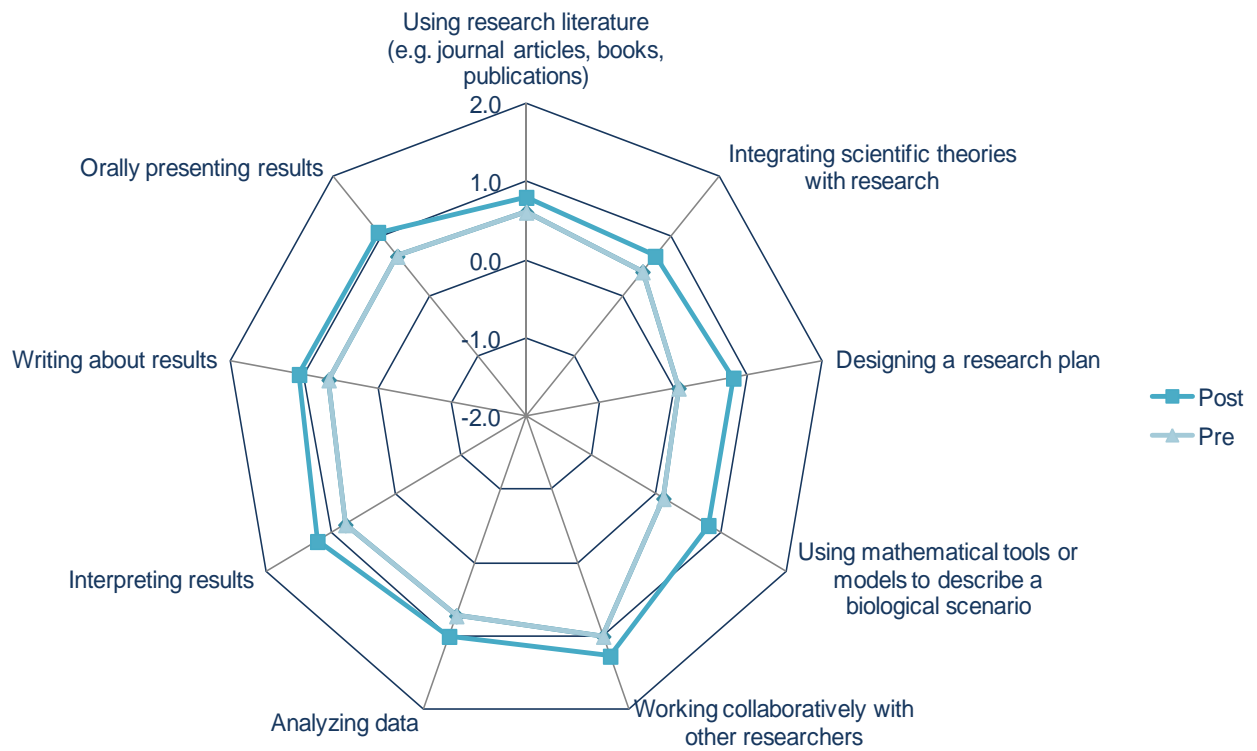
Figure 26. Participant pre- and post-program knowledge, response scale of -2 = extremely poor understanding to 2 = excellent understanding

UNDERGRADUATE RESEARCH CONFERENCE AT THE INTERFACE OF BIOLOGY AND MATHEMATICS (URC)

The NIMBioS second annual Undergraduate Research Conference at the Interface of Biology and Mathematics took place at the University of Tennessee's Conference Center in downtown Knoxville November 17-18, 2012. 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 Kelly Moran.

Nearly 115 participants from 45 institutions throughout the United States participated in the event. The fourth annual undergraduate research conference provided opportunities for undergraduates to present their research at the interface of biology and mathematics. Student talks and posters were featured as well as a panel discussion on career opportunities. Evaluation surveys were sent to all participants in the conference, with the exception of NIMBioS affiliates and event organizers. A total of 76 participants took part in the evaluation.

CONTEXT

1. Participants will be satisfied with the conference overall.
2. The conference will meet participant expectations.
3. Participants will feel the conference allowed them to make new connections with others in math and biology.
4. Participants will feel they gained a better understanding of undergraduate research happening at the interface of mathematics and biology.
5. Undergraduate participants feel the conference will have an impact on their future career plans.
6. Participants will be satisfied with the accommodations offered by NIMBioS.

SUMMARY OF URC EVALUATION RESPONSES

Figure 27. *Respondent agreement levels with statements about various aspects of the conference*
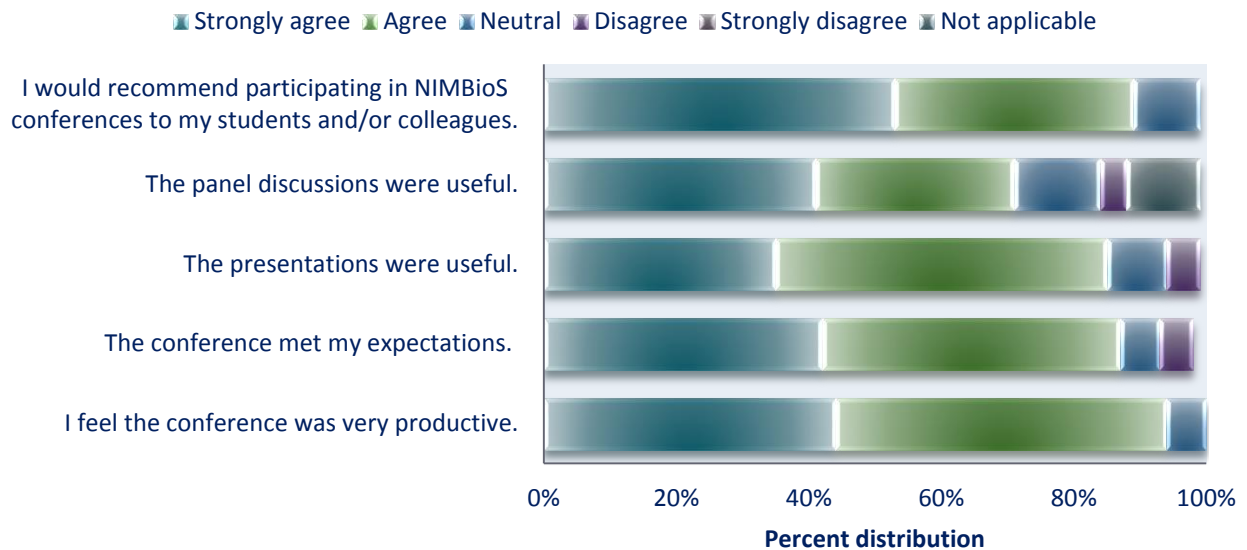
Figure 28. *As a result of attending this conference, I have a better understanding of:*
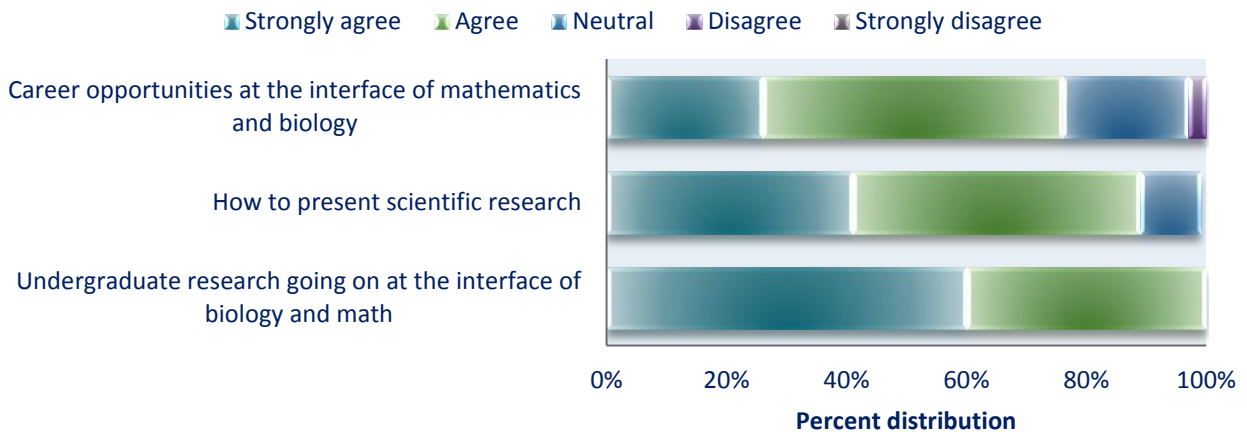
NIMBIOS POSTDOCTORAL FELLOW EXIT SURVEY SUMMARY

NIMBioS provides an opportunity for postdoctoral scholarship at the interface between mathematics and biological science that builds upon the experiences gained through the many successful postdoctoral fellows who have been in residence at the University of Tennessee, Knoxville over the past decades. Postdoctoral scholars propose synthetic projects that require an amalgam of mathematical and biological approaches, and are expected to include explicit opportunities to expand the scholar's previous education. Projects should not require the collection of additional empirical data, but may involve many aspects (collating, formulating data bases, developing models) of synthesizing existing data. Applications are welcome from those with a range of both biological and mathematical prior experience, with highest priority given to those with explicit plans to develop their ability to effectively carry on research across these fields.

Postdoctoral Fellowships are for two years (assuming satisfactory progress toward research goals in year one). Under appropriate circumstances applicants may request periods shorter than two years, and in special circumstances a Fellow may request an extension beyond two years. NIMBIOS Postdoctoral Fellows are encouraged to participate in grant proposal development Workshops offered through UT and Fellows are permitted to serve as a Principal Investigator on grant proposals submitted through NIMBioS.

Upon leaving the Postdoctoral Fellowship program at NIMBioS, program participants are asked to fill out a short exit evaluation form that examines several aspects of satisfaction with the program's operations. To date, all 11 alumni from the program have filled out the form.

CONTEXT

1. Participants will be satisfied with the structure of the program.
2. Participants will feel the program has been valuable to their academic careers.
3. Participants will be satisfied with the accommodations offered by NIMBioS to conduct research.
4. Participants will be with their mentors overall.
5. Participants will be satisfied with the types of advice/assistance received from their mentors.
6. Participants will be satisfied with the opportunity to participate in education and outreach activities.
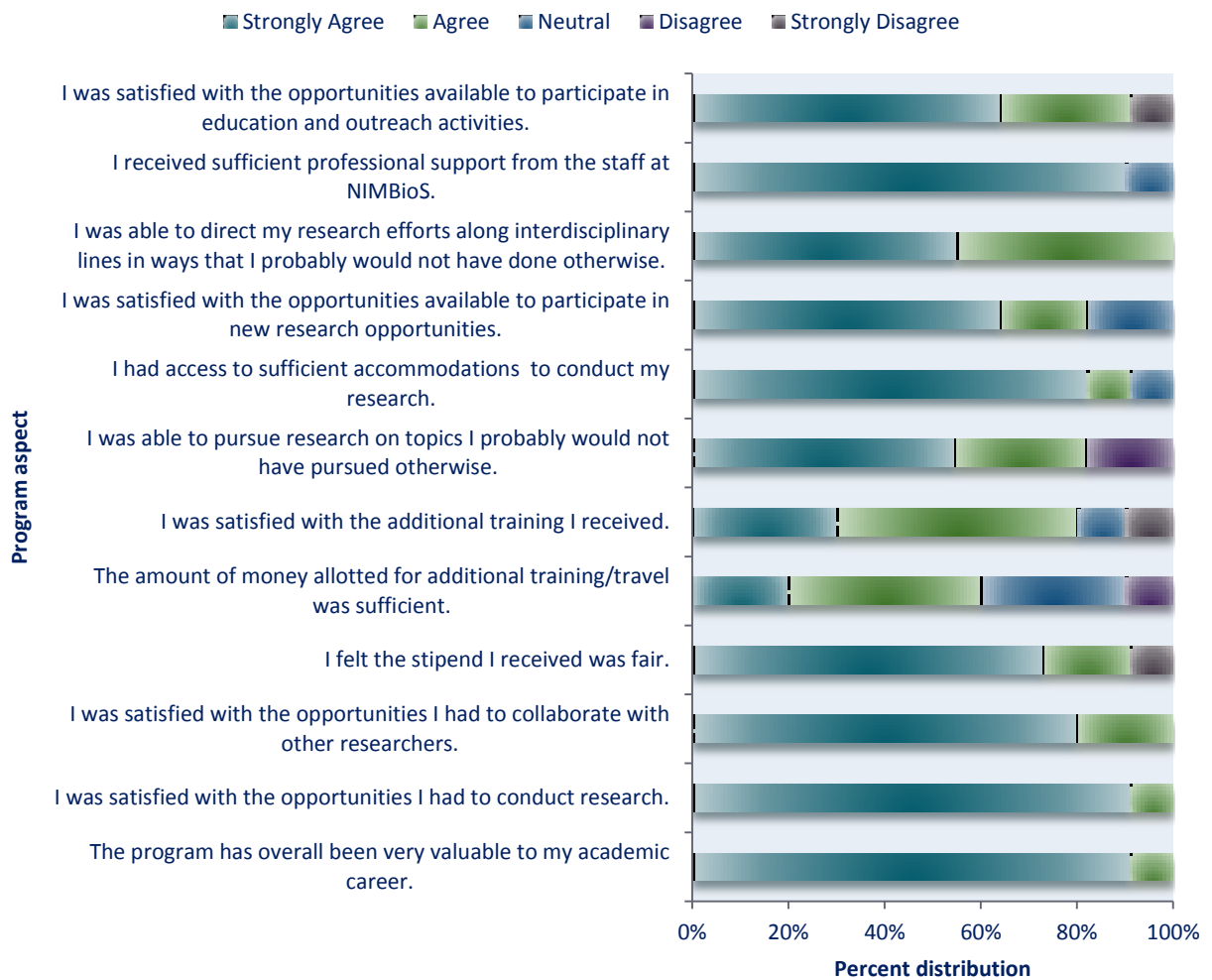
SUMMARY OF POSTDOCTORAL FELLOWSHIP PROGRAM RESPONSES

Figure 29. Postdoctoral fellow satisfaction with program mentors
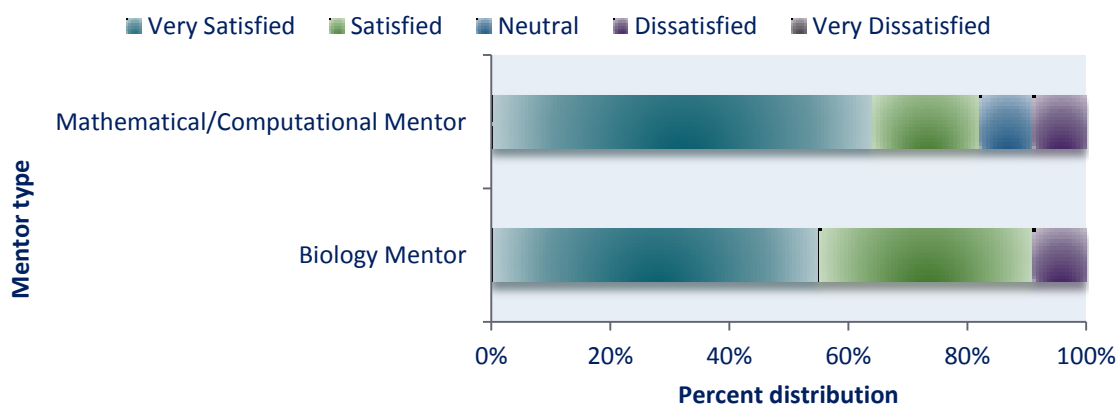
Figure 30. Postdoctoral fellow satisfaction with advice/assistance received from program mentors

■ Very Satisfied ■ Satisfied ■ Neutral ■ Dissatisfied ■ Very Dissatisfied
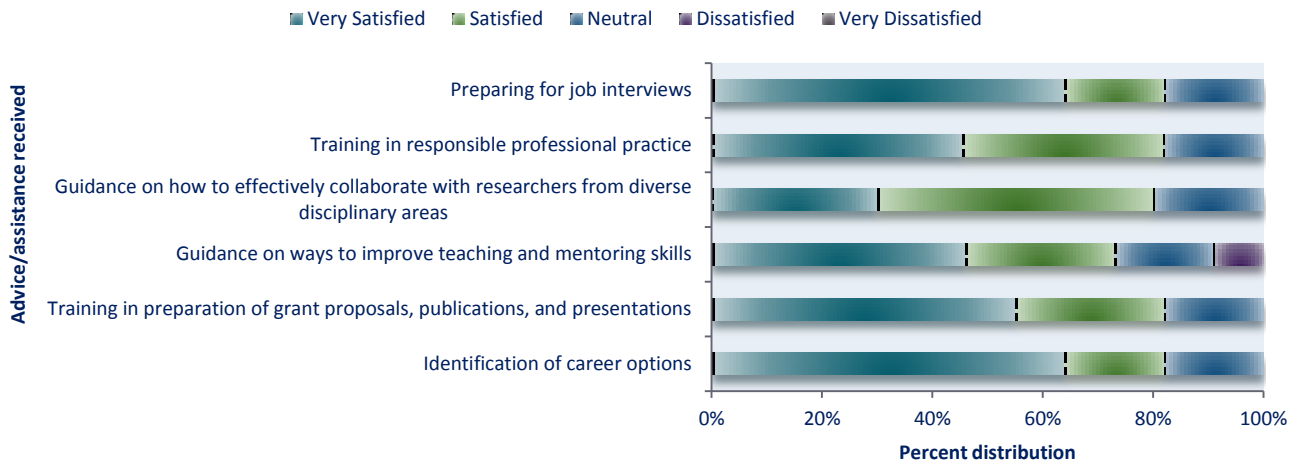
Figure 31. Postdoctoral fellow satisfaction with overall program experience

■ Strongly Agree ■ Agree ■ Neutral ■ Disagree ■ Strongly Disagree

PRODUCT EVALUATION

The results produced from NIMBioS research activities are important in measuring its success. The product evaluation seeks to monitor, document, and assess the quality and significance of the outcomes of NIMBioS activities. Data sources for product evaluations include participant self-report of NIMBioS products resulting from affiliation (e.g. journal articles, student education, and software), Web of Science data, and data collected from participant evaluation forms and follow-up surveys.

CONTEXT

As it generally takes at least full years 5 years before a bibliometric study can show relevant citation data for a center such as ours, NIMBioS currently is not yet fully addressing goal 2. NIMBioS plans to fully address all goals for the entire center in the coming years as the data become available.

1. NIMBioS publications will be highly interdisciplinary.
2. NIMBioS publications will be highly cited.
3. NIMBioS publications will highly collaborative.
4. NIMBioS participants will produce other scholarly products, including book chapters, presentations, proposals for follow-on research, meetings/Workshops, student education, data/software, and/or publicity in other media.

PUBLICATIONS

Activities at NIMBioS have led to 243 published journal articles from 2009-May 31, 2013 (Figure 32). An additional 17 articles are currently accepted for publication or in press, and 11 have been submitted for review. The articles cover research ranging across many areas of ecology, evolutionary biology, applied mathematics, and computational biology.

Figure 32. Number of publications reported from NIMBioS activities since 2009, by publication year

*2013 includes publications submitted by participants to NIMBioS through May 31, 2013

NIMBioS publications come from a variety of activities, although Working Group participants tend to publish the largest portion of journal articles (33%), followed by NIMBioS Postdoctoral Fellows (21%) (Figure 33).

Figure 33. Distribution of journal publications submitted to NIMBioS by participants
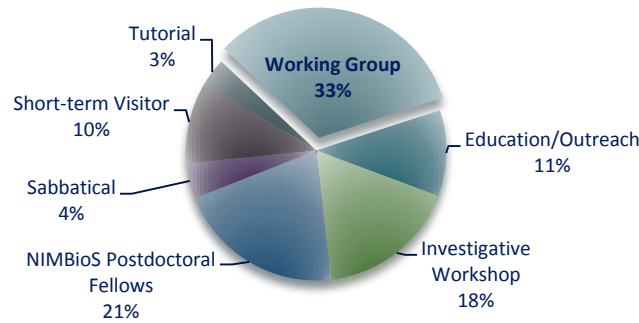
WEB OF SCIENCE DATA

Of the 243 journal articles reported by NIMBioS participants, 211 are indexed in the Institute for Scientific Information's (ISI) Web of Science (WOS). Data in the following sections are based on these articles, which involved 380 researchers from 265 unique institutions spanning 38 countries. These articles have appeared in 125 different publications, many of which are considered to have high-impact in the academic community (Table 4).

Table 4. Number of NIMBioS articles published in a selection of high-impact journals, sorted by journal 5-Year Impact Factor

Journal Title	5-Year Impact Factor	# of NIMBioS Publications in Year 5	# of NIMBioS Publications as of May 2013
Nature	38.159	1	2
Cell	34.366	1	1
Science	33.587	1	4
Ecology Letters	18.495	2	6
Trends in Ecology and Evolution	17.112	2	4
Systematic Biology	13.316	-	1
Proceedings of the National Academy of Sciences	10.583	3	9
PLoS Genetics	9.440	1	2
Nucleic Acids Research	8.055	-	2
Phil Trans of the Royal Soc B-Biological Sciences	7.298	1	2
Molecular Ecology	6.792	-	3
Ecology	6.372	2	4
PLoS Computational Biology	5.939	2	3
Proc of the Royal Soc B-Biological Sciences	5.832	3	5
Evolution	5.402	2	7
The American Naturalist	5.332	3	7
Journal of Animal Ecology	5.166	-	2
PLoS One	4.244	6	12
Animal Behaviour	3.405	3	5

* The journal impact factor is a measure of the frequency with which the "average article" in a journal has been cited in a particular year. The impact factor is an indicator of a journal's relative importance, especially as compared to other journals in the same field. Impact factor calculation: cites in year n to articles published in year (n-1 + n-2)/number of articles published in year(n- 1 + n-2).

DISCIPLINARY SPAN OF PUBLICATIONS

The 211 published articles span 69 discipline areas, as designated by the ISI WOS Subject Categories. Subject Categories are assigned at the journal level based upon a combination of citation patterns and editorial judgment at the ISI. Subject categories are used in bibliometric research as a representation of the research areas in which scientists work.

The most common subject category in which NIMBioS publications fell was Ecology (62), followed by Evolutionary Biology (41), Multidisciplinary Sciences (31), Biology (30), Mathematical & Computational Biology (30), and Genetics & Heredity (23). Figure 34 locates the subject categories of the 221 NIMBioS articles on a network map of the WOS Subject Categories. The gray background intersections are the 224 WOS Subject Categories, located based on cross-citation relationships among all WOS journals in 2007 (from Rafols, Porter, and Leydesdorff, 2009). The 19 labeled "macro-disciplines" are based on factor analysis of that cross-citation matrix also. Nearness on the map indicates a closer relationship among disciplines. Circular node sizes reflect the relative number of NIMBioS participant publications.

**Figure 34. Web of Science Subject Categories for 221 WoS journal articles to date**
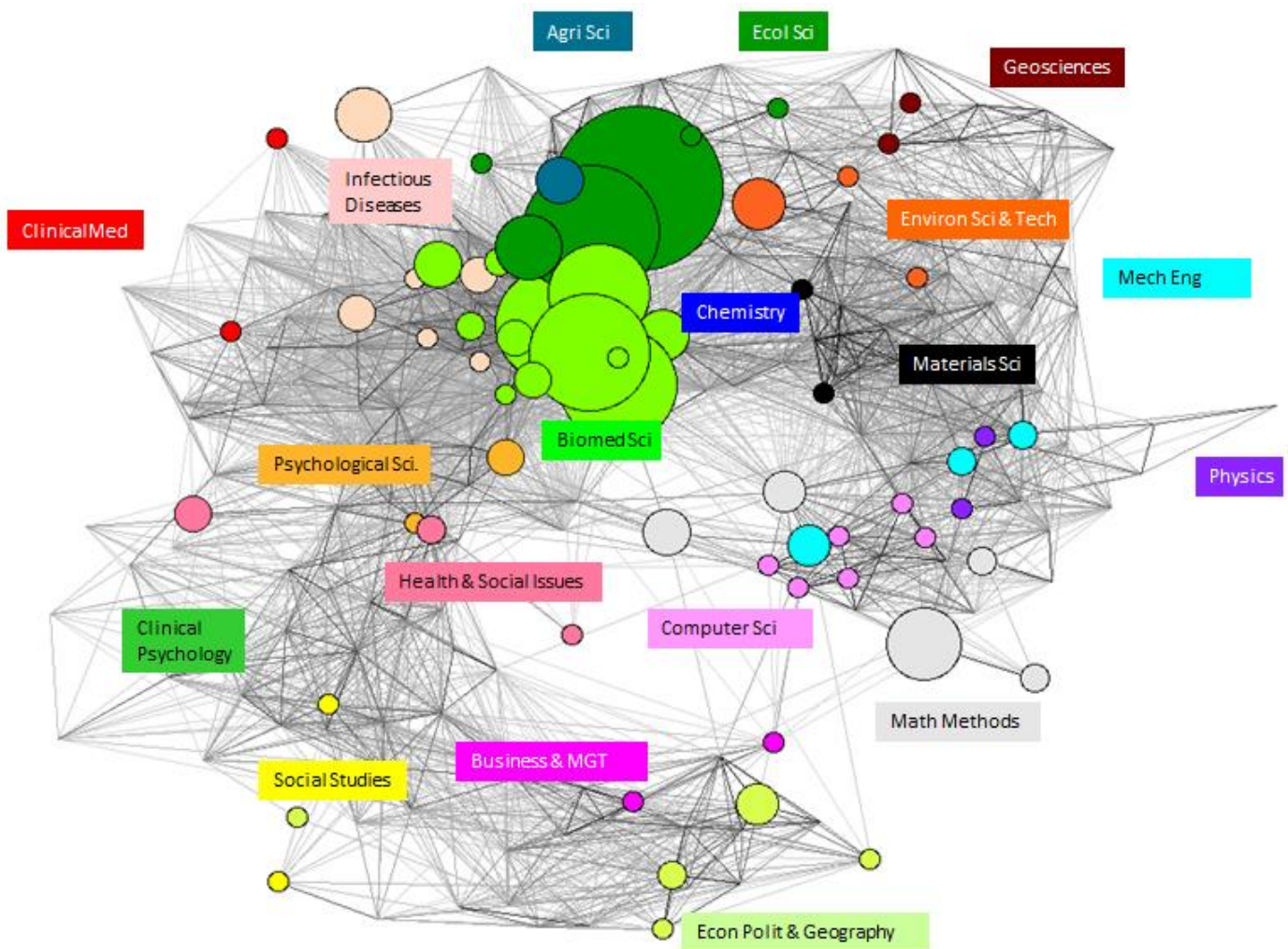
Method from Rafols, Porter and Leydesdorff (2009)

COLLABORATION

One of the core values of NIMBioS is to take a collaborative approach to science and science education. We are interested, therefore, in examining the number of co-authors on NIMBioS-related publications as one indicator of scientific collaboration. For the 211 publications reported thus far, the average number of co-authors per paper is 3.9 (Figure 35).

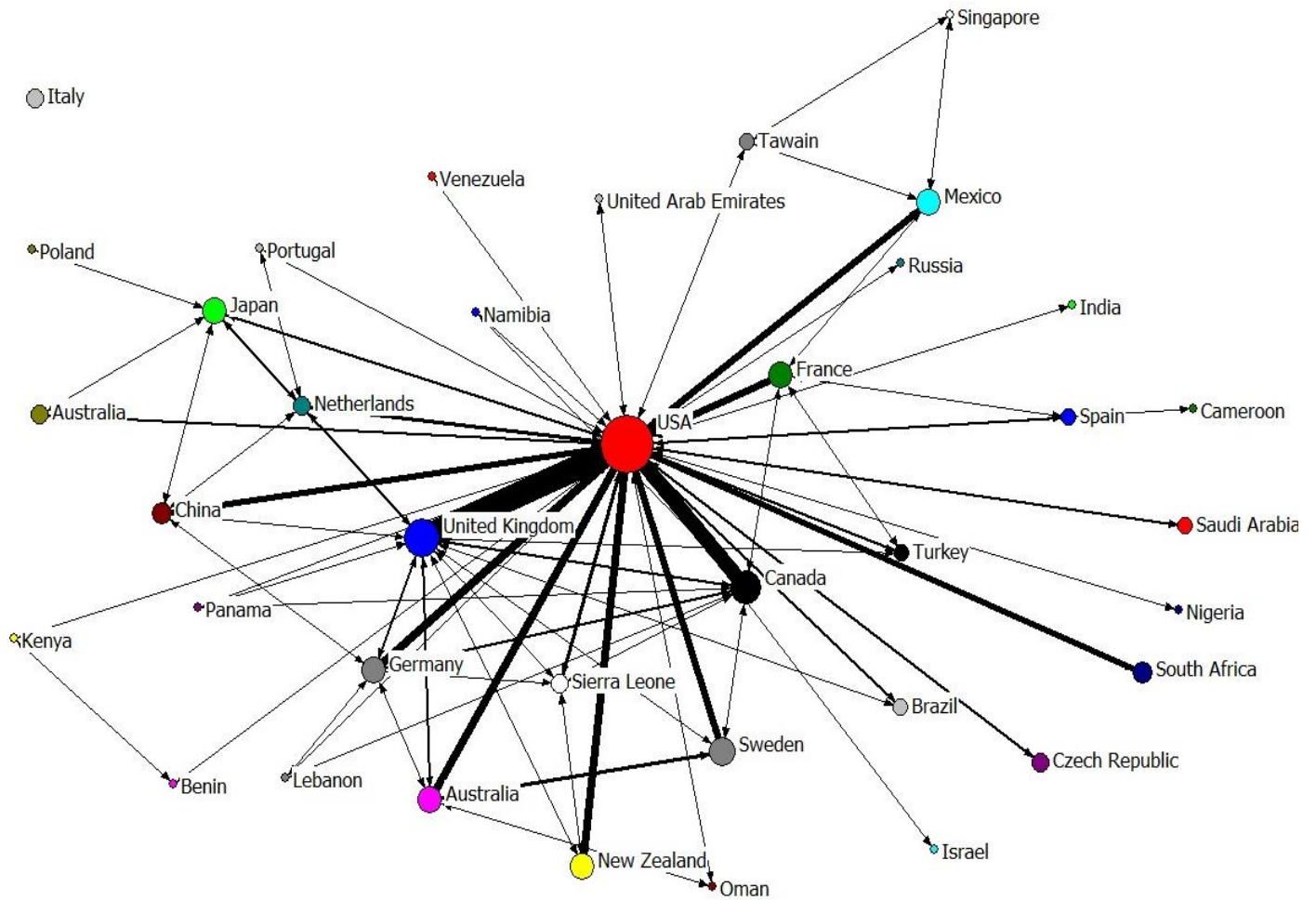**Figure 35. Coauthorship of NIMBioS publications**
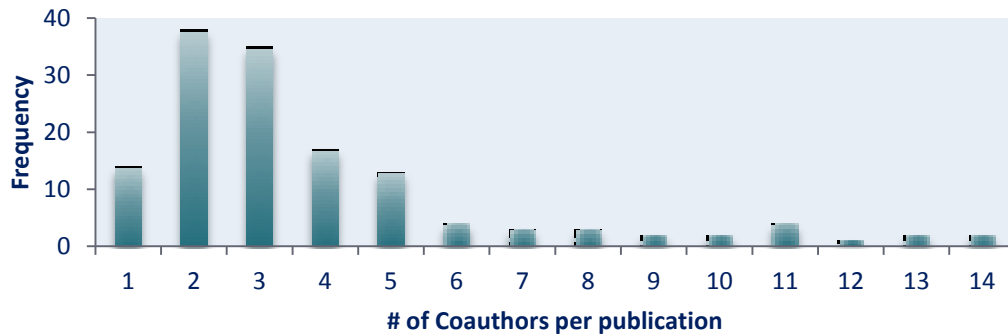
Analysis of the authorship network of NIMBioS journal articles for all events revealed 42 distinct "collaborative components" among products, each having between 1 and 52 coauthors involved. In the network graph below (Figure 36), coauthors are colored by main component. Black circles represent papers and colored squares represent coauthors of papers. Nodes are sized by numbers of ties within the graph (i.e. publications with more coauthors are larger and authors with more publications are larger). Coauthors may or may not be NIMBioS participants. Network analysis reveals key producers within the body of NIMBioS work as well. Three participants have authored eight or more papers, while nine have authored between five and seven. Future planned network analyses of NIMBioS products will examine the participant status of authors, and also the event from which each publication has arisen to examine cross-collaboration among events.

Figure 36. Participant paper collaboration network
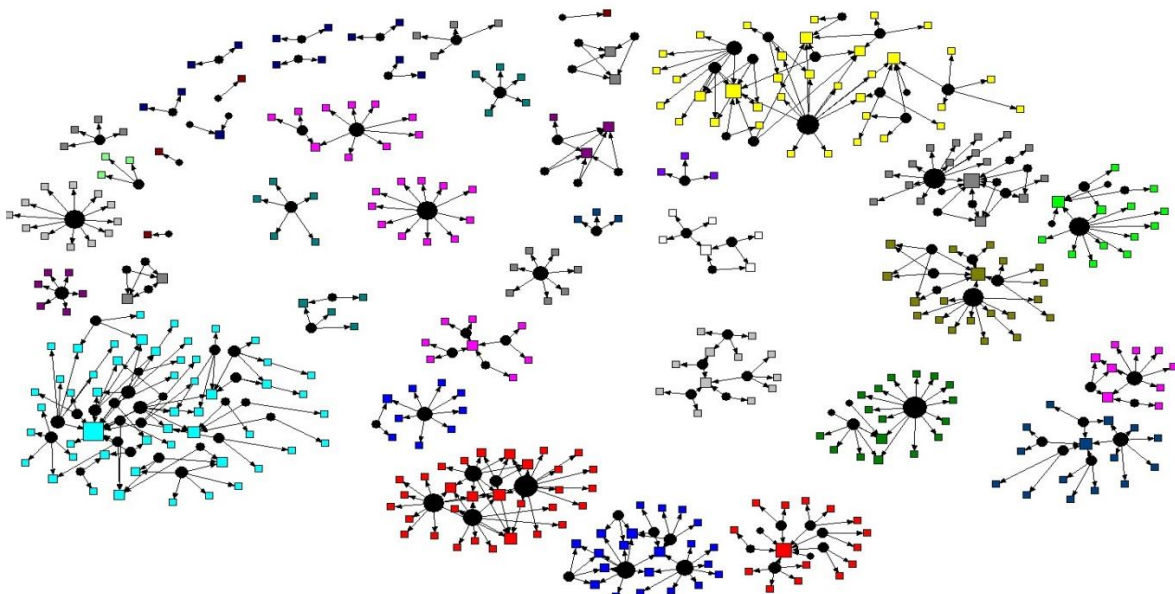
NIMBioS also fosters international collaboration among researchers. While 38 different countries have been represented by NIMBioS coauthorship through the current reporting period, the average number of countries of coauthors per paper is 1.7, with a range of 1-11 countries represented per paper. In Figure 37, node radius represents the log scaled number of NIMBioS-affiliated papers from each country, and line size represents the number of collaborations among countries on these papers.

Figure 37. International collaboration of NIMBioS publications

Coauthors of NIMBioS publications through the current reporting period came from 265 unique institutions. The average number of institutions represented per paper was 2.70, with a range of 1-14 institutions per paper (Figure 38). In Figure 38, node radius represents the log scaled number of NIMBioS-affiliated papers from each institution, and line size represents the number of collaborations among institutions on these papers. NIMBioS is at the center of the graph.

Figure 38. Cross-institutional collaboration of NIMBioS publications
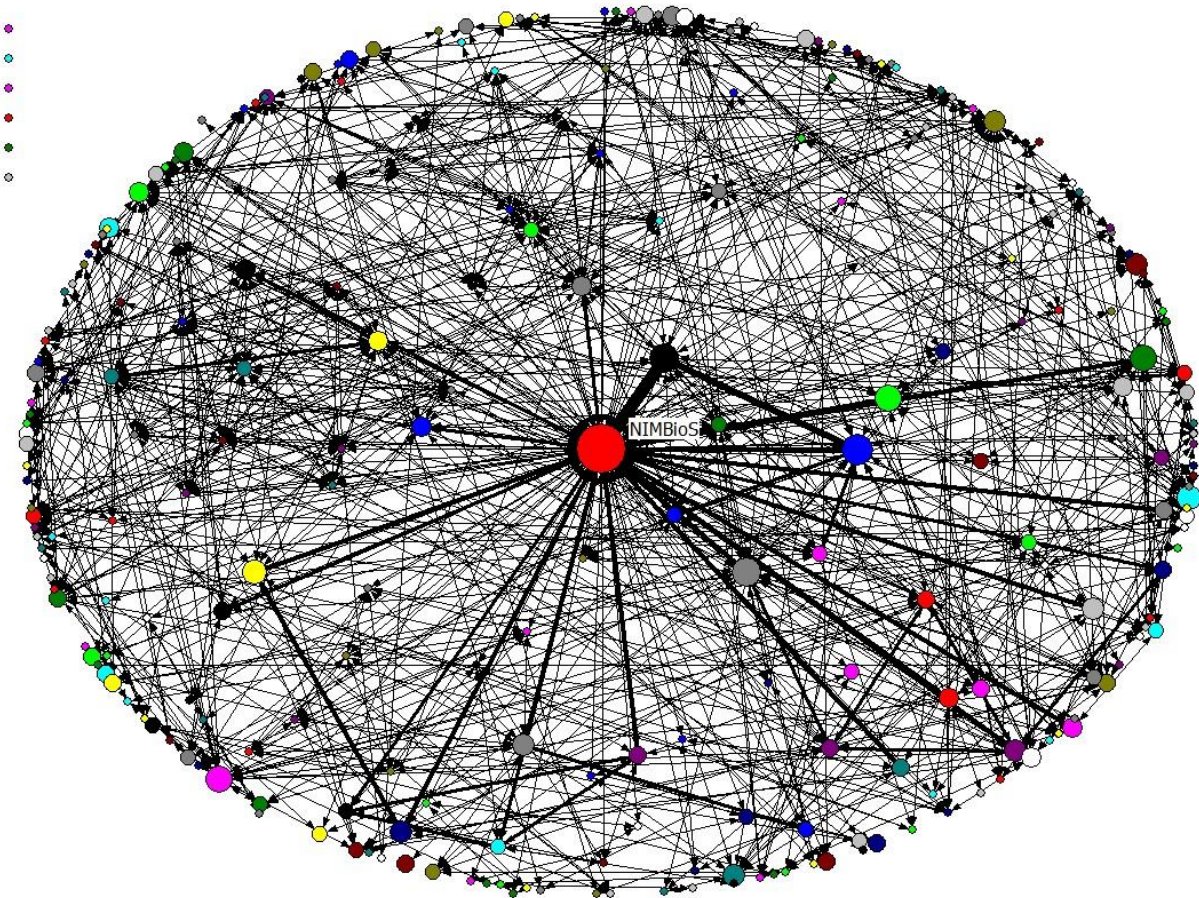
OTHER SCHOLARLY PRODUCTS

In addition to journal publications, participants report other types of products that have resulted from their activities at NIMBioS. Figure 39 summarizes these types of products for the five-year period.

Figure 39. Non-journal publication products arising from NIMBioS events
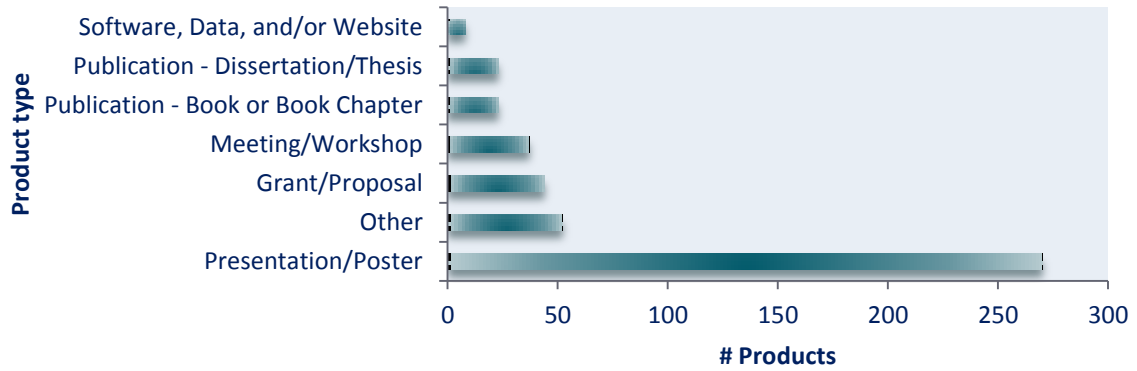
Addendum to NIMBioS Annual Report

Sep 1, 2012 –Aug 31, 2013

Y5-3. Participant List for NIMBioS Events and Activities

Advisory Board Event	Start Date	End Date
October Board Meeting	**11-Oct-12**	**12-Oct-12**

Eli Fenichel (Agricultural Sciences/Natural Resources)
Julius Jackson (Biological/Biomedical Sciences)
Laura Kubatko (Mathematics)
Carl (John) Panetta (Biological/Biomedical Sciences)
Raina (Rayna) Robeva (Mathematics)
Lisa Sattenspiel (Social Sciences)
Marcy Uyenoyama (Biological/Biomedical Sciences)
Jianhong Wu (Mathematics)

Advisory Board Event	Start Date	End Date
April Virtual Board Meeting	**01-Apr-13**	**01-Apr-13**

Erika Camacho (Mathematics)
Eli Fenichel (Agricultural Sciences/Natural Resources)
Laura Kubatko (Mathematics)
Kiona Ogle (Biological/Biomedical Sciences)
Carl (John) Panetta (Biological/Biomedical Sciences)
Raina (Rayna) Robeva (Mathematics)
Lisa Sattenspiel (Social Sciences)
Ynte Schukken (Health Sciences)
Colleen Webb (Biological/Biomedical Sciences)
Jianhong Wu (Mathematics)

Advisory Board Event	Start Date	End Date
January Virtual Board Meeting	**28-Jan-13**	**28-Jan-13**

Sarah Brosnan (Biological/Biomedical Sciences)
Erika Camacho (Mathematics)
Sarah Elgin (Chemistry)
Eli Fenichel (Agricultural Sciences/Natural Resources)
Colleen Jonsson (Biological/Biomedical Sciences)
Laura Kubatko (Mathematics)
Kiona Ogle (Biological/Biomedical Sciences)
Carl (John) Panetta (Biological/Biomedical Sciences)
Raina (Rayna) Robeva (Mathematics)
Lisa Sattenspiel (Social Sciences)
Ynte Schukken (Health Sciences)
Colleen Webb (Biological/Biomedical Sciences)
Jianhong Wu (Mathematics)

Education/Outreach Event	Start Date	End Date
Graduate Research Assistant	**01-Aug-12**	**30-Apr-13**

Mark DeCotes (Computer & Information Sciences)
Gwenllian Iacona (Biological/Biomedical Sciences)
John Martin (Computer & Information Sciences)
Marco Martinez (Not reported)
Eric Numfor (Mathematics)
Adam Sullivan (Engineering)

Education/Outreach Event	Start Date	End Date
NIMBioS Seminar Series Speakers		
Gesham Magombedze (Mathematics)	04-Sep-12	04-Sep-12
Jiang Jiang (Biological/Biomedical Sciences)	18-Sep-12	18-Sep-12
Klaas Hartmann (Agricultural Sciences/Natural Resources)	20-Sep-12	20-Sep-12
Arik Kershenbaum (Biological/Biomedical Sciences)	02-Oct-12	02-Oct-12
Keenan Mack (Biological/Biomedical Sciences)	16-Oct-12	16-Oct-12
Julia Earl (Biological/Biomedical Sciences)	30-Oct-12	30-Oct-12
Simon Levin (Biological/Biomedical Sciences)	13-Nov-12	13-Nov-12
Matthew Spencer (Biological/Biomedical Sciences)	27-Nov-12	27-Nov-12
Odo Diekmann (Mathematics)	15-Jan-13	15-Jan-13
Daniel Blumstein (Biological/Biomedical Sciences)	17-Jan-13	17-Jan-13
Helene Muller-Landau (Biological/Biomedical Sciences)	29-Jan-13	29-Jan-13
David Gurarie (Mathematics)	12-Feb-13	12-Feb-13
Kamuela Yong (Mathematics)	21-Feb-13	21-Feb-13
Ludek Berec (Biological/Biomedical Sciences)	26-Feb-13	26-Feb-13
Anna (Michelle) Lawing (Biological/Biomedical Sciences)	05-Mar-13	05-Mar-13
Ryan Martin (Biological/Biomedical Sciences)	19-Mar-13	19-Mar-13
Amiyaal Ilany (Biological/Biomedical Sciences)	02-Apr-13	02-Apr-13
Lisa Sattenspiel (Social Sciences)	09-Apr-13	09-Apr-13
Thomas (Tom) Currie (Social Sciences)	16-Apr-13	16-Apr-13
Christopher (Chris) Remien (Mathematics)	16-Apr-13	16-Apr-13
Jeremy Beaulieu (Biological/Biomedical Sciences)	23-Apr-13	23-Apr-13
Andrew Kramer (Biological/Biomedical Sciences)	06-Feb-13	06-Feb-13

Education/Outreach Event	Start Date	End Date
Undergraduate Research Conference (URC) 2012	**17-Nov-12**	**18-Nov-12**

Donald Adongo (Mathematics)
Folashade Agusto (Mathematics)
Christina Allan (Mathematics)
Alex Amorim (Education)
Kathryn Barry (Biological/Biomedical Sciences)
Emma Baumhofer (Biological/Biomedical Sciences)
Chris Becker (Mathematics)
John Berges (Ocean/Marine Sciences)
Deborah Boedeker (Mathematics)
Sarah Bogen (Mathematics)
Hannah Brewer (Mathematics)
Courtney Bruce (Biological/Biomedical Sciences)
Jillian Burke (Agricultural Sciences/Natural Resources)
Blake Burkett (Mathematics)
Wenting Cai (Chemistry)
Andrea Calderon (Biological/Biomedical Sciences)
Emily Cate (Biological/Biomedical Sciences)
Sami Cheong (Mathematics)
Theresa Dalmut (Mathematics)
Amitpal Dhillon (Biological/Biomedical Sciences)
Stephanie Dodson (Physics)
Noah Dukler (Biological/Biomedical Sciences)
Rene Duran (Biological/Biomedical Sciences)
Alexander Earhart (Biological/Biomedical Sciences)

Julia Earl (Biological/Biomedical Sciences)
Ashley Featherstone (Mathematics)
Paula Federico (Mathematics)
Nicole Fiorentino (Mathematics)
Jennifer Flynn (Biological/Biomedical Sciences)
Ellen Ford (Biological/Biomedical Sciences)
Bryce Frazier (Computer & Information Sciences)
Andrew Gibson (Biological/Biomedical Sciences)
Megan Gier (Mathematics)
Michael (Mike) Gilchrist (Biological/Biomedical Sciences)
John Glasser (Health Sciences)
Traci Grant (Mathematics)
Travis Griffin (Education)
Logan Grimes (Biological/Biomedical Sciences)
Louis Gross (Biological/Biomedical Sciences)
Whitney Hall (Biological/Biomedical Sciences)
Mahjub Hammond (Social Sciences)
Michael Harris (Biological/Biomedical Sciences)
William Harris (Mathematics)
Christine Heitsch (Mathematics)
Kevin Herold (Biological/Biomedical Sciences)
Preston Hewgley (Biological/Biomedical Sciences)
Emily Holz (Engineering)
Xi Huo (Biological/Biomedical Sciences)
Eric Jalbert (Mathematics)
Aubrie James (Biological/Biomedical Sciences)
Jiang Jiang (Biological/Biomedical Sciences)
Jennifer Jordan (Mathematics)
Nathan Kopp (Biological/Biomedical Sciences)
Sarah Kramer (Biological/Biomedical Sciences)
Nitin Krishna (Mathematics)
Ryan Landrith (Biological/Biomedical Sciences)
Nhan Le (Mathematics)
Karin Leiderman (Mathematics)
Suzanne Lenhart (Mathematics)
Grant Libra (Biological/Biomedical Sciences)
Martina Little (Not reported)
Lijia Liu (Mathematics)
John Lombardi (Mathematics)
Jessica Lunsford (Mathematics)
Kara Maki (Mathematics)
Scott Manifold (Mathematics)
Charles (Kurtis) Mann (Biological/Biomedical Sciences)
Clayton Marolt (Biological/Biomedical Sciences)
Christopher Mecklin (Mathematics)
Luis Melara (Mathematics)
Chris Miles (Engineering)
Eric Mooring (Biological/Biomedical Sciences)
John Morell (Other Professional Field)
Anna Mummert (Mathematics)
Kyle Niezgoda (Mathematics)
Arielle Nivens (Mathematics)
Andres Ortiz (Mathematics)

Jeffrey Ovall (Mathematics)
Thomas Parrish (Mathematics)
Sam Pellock (Biological/Biomedical Sciences)
Hannah Pennington (Health Sciences)
Andre Perez-Orozco (Biological/Biomedical Sciences)
Gabriel Provencher Langlois (Mathematics)
Jessica Robins (Mathematics)
Kevin Roche (Mathematics)
Rachel Roe-Dale (Mathematics)
Caitlin Ross (Computer & Information Sciences)
Brandon Russell (Mathematics)
Pam Ryan (Mathematics)
Jan Rychtar (Mathematics)
Samuel Saarinen (Mathematics)
Loren Santana (Mathematics)
Sara Schaal (Biological/Biomedical Sciences)
Richard Schugart (Mathematics)
Alexandra Signoriello (Mathematics)
Tracy Spears Gill (Mathematics)
Natalie Stanley (Mathematics)
Joseph (Joe) Strini (Biological/Biomedical Sciences)
Paige Stubbs (Mathematics)
Jordana Stuntebeck (Biological/Biomedical Sciences)
Kelly Sturner (Agricultural Sciences/Natural Resources)
Elizabeth Tarter (Biological/Biomedical Sciences)
Colin Teberg (Computer & Information Sciences)
Drew Thatcher (Biological/Biomedical Sciences)
Tara Thean (Biological/Biomedical Sciences)
Andrew Thompson (Mathematics)
Anna Tuck (Mathematics)
Kiersten Utsey (Mathematics)
Elyse Vaughn (Biological/Biomedical Sciences)
Carol Wu (Mathematics)
Yang Xie (Mathematics)
Karrisa Yang (Biological/Biomedical Sciences)
Francis Yankey (Biological/Biomedical Sciences)
Tim Zeidler (Biological/Biomedical Sciences)

Investigative Workshop Event	Start Date	End Date
Systems and Synthetic Microbiology Workshop	**11-Mar-13**	**13-Mar-13**

Gladys Alexandre (Biological/Biomedical Sciences)
Seda Arat (Mathematics)
Munehiro Asally (Biological/Biomedical Sciences)
Gabor Balazsi (Physics)
Attila Csikasz-Nagy (Biological/Biomedical Sciences)
Domitilla Del Vecchio (Engineering)
Jennifer Galovich (Mathematics)
Jeff Gore (Biological/Biomedical Sciences)
Oleg Igoshin (Engineering)
Amiyaal Ilany (Biological/Biomedical Sciences)
David Karig (Biological/Biomedical Sciences)
Tatiana Karpinets (Biological/Biomedical Sciences)

Minsu Kim (Physics)
Isaac Klapper (Mathematics)
Meta Kuehn (Biological/Biomedical Sciences)
Christian Laing (Mathematics)
Anita Layton (Mathematics)
Joshua Leonard (Engineering)
Andre Levchenko (Engineering)
Gesham Magombedze (Mathematics)
Babak Momeni (Biological/Biomedical Sciences)
Ilya Nemenman (Physics)
Michele Nishiguchi (Ocean/Marine Sciences)
Timothée Poisot (Biological/Biomedical Sciences)
Christopher Rao (Engineering)
Andrea Rocha (Biological/Biomedical Sciences)
Sima Setayeshgar (Physics)
Wenying Shou (Biological/Biomedical Sciences)
Shaneka Simmons (Biological/Biomedical Sciences)
Jennifer Talbot (Biological/Biomedical Sciences)
Yu Tanouchi (Engineering)
Jin Wang (Physics)
Xiao Wang (Engineering)
Katrine Whiteson (Biological/Biomedical Sciences)
Jie Xiao (Biological/Biomedical Sciences)
Lingchong You (Engineering)
Xiaopeng   Zhao   (Engineering)

Postdoctoral Fellowship Event	Start Date	End Date
Postdoctoral Fellow		
Xavier Thibert-Plante (Biological/Biomedical Sciences)	01-May-10	31-Oct-12
Orou Gaoue (Biological/Biomedical Sciences)	01-Jun-11	31-May-13
Juanjuan (JJ) Chai (Mathematics)	01-Jul-11	28-Jun-13
Andrew Kanarek (Biological/Biomedical Sciences)	01-Aug-11	01-Jul-13
Calistus Ngonghala (Mathematics)	01-Aug-11	01-Jul-13
Daniel (Dan) Ryan (Mathematics)	01-Aug-11	01-Jul-13
Thomas (Tom) Ingersoll	01-Sept-10	28-Feb-13
Maud Lelu (Biological/Biomedical Sciences)	01-Nov-11	01-Oct-13
Gesham Magombedze (Mathematics)	01-Jan-12	31-Dec-13
Jiang Jiang (Biological/Biomedical Sciences)	30-Jul-12	01-Jul-14
Arik Kershenbaum (Biological/Biomedical Sciences)	06-Aug-12	01-Jul-14
Keenan Mack (Biological/Biomedical Sciences)	15-Aug-12	01-Jul-14
Julia Earl (Biological/Biomedical Sciences)	27-Aug-12	01-Jul-14
Jeremy Beaulieu (Biological/Biomedical Sciences)	04-Sep-12	01-Aug-14
Ryan Martin (Biological/Biomedical Sciences)	10-Sep-12	01-Aug-14
Christopher (Chris) Remien (Mathematics)	17-Sep-12	01-Aug-14
Amiyaal Ilany (Biological/Biomedical Sciences)	08-Oct-12	01-Sep-14
Anna (Michelle) Lawing (Biological/Biomedical Sciences)	03-Dec-12	01-Nov-14

Postdoctoral Fellowship Event	Start Date	End Date
Postdoctoral Fellow Mentor		
Benjamin (Ben) Fitzpatrick (Mathematics)	01-May-10	31-Oct-12
Sergey Gavrilets (Biological/Biomedical Sciences)	01-May-10	31-Oct-12
Judy Day (Mathematics)	01-Sep-10	28-Feb-13
Thomas Hallam (Biological/Biomedical Sciences)	01-Sep-10	28-Feb-13
Gary McCracken (Biological/Biomedical Sciences)	01-Sep-10	28-Feb-13
Louis Gross (Biological/Biomedical Sciences)	01-Jun-11	31-May-13
Nate Sanders (Biological/Biomedical Sciences)	01-Jun-11	31-May-13
Michael (Mike) Gilchrist (Biological/Biomedical Sciences)	01-Jul-11	28-Jun-13
Brian O'Meara (Biological/Biomedical Sciences)	01-Jul-11	28-Jun-13
Paul Armsworth (Biological/Biomedical Sciences)	01-Aug-11	01-Jul-13
Paul Armsworth (Biological/Biomedical Sciences)	01-Aug-11	01-Jul-13
Sergey Gavrilets (Biological/Biomedical Sciences)	01-Aug-11	01-Jul-13
Cristina Lanzas (Health Sciences)	01-Aug-11	01-Jul-13
Suzanne Lenhart (Mathematics)	01-Aug-11	01-Jul-13
Suzanne Lenhart (Mathematics)	01-Aug-11	01-Jul-13
Suzanne Lenhart (Mathematics)	01-Nov-11	01-Oct-13
Chunlei Su (Biological/Biomedical Sciences)	01-Nov-11	01-Oct-13
Shigetoshi Eda (Agricultural Sciences/Natural Resources)	01-Jan-12	31-Dec-13
Vitaly Ganusov (Health Sciences)	01-Jan-12	31-Dec-13
Aimee Classen (Biological/Biomedical Sciences)	30-Jul-12	01-Jul-14
Shih-Lung Shaw (Social Sciences)	30-Jul-12	01-Jul-14
Judy Day (Mathematics)	06-Aug-12	01-Jul-14
Todd Freeberg (Psychology)	06-Aug-12	01-Jul-14
Paul Armsworth (Biological/Biomedical Sciences)	15-Aug-12	01-Jul-14
Nate Sanders (Biological/Biomedical Sciences)	15-Aug-12	01-Jul-14
Paul Armsworth (Biological/Biomedical Sciences)	27-Aug-12	01-Jul-14
Matthew Gray (Biological/Biomedical Sciences)	27-Aug-12	01-Jul-14
Jim Fordyce (Biological/Biomedical Sciences)	04-Sep-12	01-Aug-14
Brian O'Meara (Biological/Biomedical Sciences)	04-Sep-12	01-Aug-14
Christopher (Darrin) Hulsey (Biological/Biomedical Sciences)	10-Sep-12	01-Aug-14
Brian O'Meara (Biological/Biomedical Sciences)	10-Sep-12	01-Aug-14
Louis Gross (Biological/Biomedical Sciences)	17-Sep-12	01-Aug-14
Nate Sanders (Biological/Biomedical Sciences)	17-Sep-12	01-Aug-14
Sergey Gavrilets (Biological/Biomedical Sciences)	08-Oct-12	01-Sep-14
Jaewook Joo (Computer & Information Sciences)	08-Oct-12	01-Sep-14
Alison Boyer (Biological/Biomedical Sciences)	03-Dec-12	01-Nov-14
Brian O'Meara (Biological/Biomedical Sciences)	03-Dec-12	01-Nov-14

Sabbatical Fellowship Event	Start Date	End Date
Sabbatical Fellow		
David Gurarie (Mathematics)	01-Sep-12	01-Apr-13
Matthew Spencer (Biological/Biomedical Sciences)	01-Sep-12	01-Jan-13
Hong Qin (Biological/Biomedical Sciences)	28-May-13	31-Jul-13

Short-Term Visitor Event	Start Date	End Date
Short-Term Visitor		
Klaas Hartmann (Agricultural Sciences/Natural Resources)	11-Sep-12	23-Sep-12
Jennifer Cooper (Ocean/Marine Sciences)	01-Oct-12	07-Oct-12
John Bruno (Biological/Biomedical Sciences)	03-Oct-12	05-Oct-12
Heather Briggs (Biological/Biomedical Sciences)	08-Nov-12	15-Nov-12
Simon Levin (Biological/Biomedical Sciences)	12-Nov-12	13-Nov-12
Angela Reynolds (Mathematics)	16-Nov-12	18-Nov-12
Linda Allen (Mathematics)	10-Dec-12	20-Dec-12
Vrushali Bokil (Mathematics)	10-Dec-12	20-Dec-12
Odo Diekmann (Mathematics)	13-Jan-13	20-Jan-13
Daniel Blumstein (Biological/Biomedical Sciences)	15-Jan-13	18-Jan-13
Kailin Kroetz (Agricultural Sciences/Natural Resources)	23-Jan-13	28-Jan-13
Helene Muller-Landau (Biological/Biomedical Sciences)	28-Jan-13	31-Jan-13
Philip Maini (Mathematics)	08-Feb-13	09-Feb-13
Kamuela Yong (Mathematics)	21-Feb-13	22-Feb-13
Patrick Ayscue (Health Sciences)	25-Feb-13	01-Mar-13
Ludek Berec (Biological/Biomedical Sciences)	25-Feb-13	28-Feb-13
Gary An (Biological/Biomedical Sciences)	01-Apr-13	03-Apr-13
Benjamin (Ben) Fitzpatrick (Mathematics)	01-Apr-13	03-Apr-13
Reinhard Laubenbacher (Mathematics)	01-Apr-13	03-Apr-13
Rene Salinas (Mathematics)	01-Apr-13	03-Apr-13
Lisa Sattenspiel (Social Sciences)	07-Apr-13	13-Apr-13
Alan Swedlund (Social Sciences)	07-Apr-13	13-Apr-13
Karoun Bagamian (Biological/Biomedical Sciences)	10-Apr-13	13-Apr-13
James (Mac) Hyman (Mathematics)	10-Apr-13	13-Apr-13
Carrie Manore (Mathematics)	10-Apr-13	13-Apr-13
Thomas (Tom) Currie (Social Sciences)	14-Apr-13	17-Apr-13
Benito Chen-Charpentier (Mathematics)	18-May-13	25-May-13
Maria Leite (Mathematics)	18-May-13	25-May-13
Jemal Mohammed-Awel (Mathematics)	27-May-13	31-May-12
Ruijun Zhao (Mathematics)	27-May-13	31-May-12

Tutorial Event	Start Date	End Date
Mathematical Modeling for the Cell Biology Researcher and Educator Tutorial	**08-Apr-13**	**10-Apr-13**

Zahra Aminzare (Mathematics)
Nadya Amor (Engineering)
William Ashby (Biological/Biomedical Sciences)
Michael Blinov (Biological/Biomedical Sciences)
Sofya Borinskaya (Biological/Biomedical Sciences)
Vidya Chandrasekaran (Biological/Biomedical Sciences)
Gerardo Felix (Biological/Biomedical Sciences)
Jennifer Galovich (Mathematics)
Rasheed Hameed (Mathematics)
Raquell Holmes (Biological/Biomedical Sciences)
Aihua Li (Mathematics)
Bing Liu (Computer & Information Sciences)
Leslie Loew (Biological/Biomedical Sciences)
Gesham Magombedze (Mathematics)
Huaiyu Mi (Biological/Biomedical Sciences)
Mohammad Ali Moni (Computer & Information Sciences)

Catherine Newman (Mathematics)
December Nunez (Not reported)
Christine Payne (Chemistry)
Edith Pierre-Jerome (Biological/Biomedical Sciences)
Hong Qin (Biological/Biomedical Sciences)
Emmanuel Quansah (Mathematics)
Cesar Quinones (Biological/Biomedical Sciences)
Sounak Sahu (Biological/Biomedical Sciences)
Maciej Swat (Physics)
Fusheng Tang (Biological/Biomedical Sciences)
Severine Van Slambrouck (Biological/Biomedical Sciences)
Ellen Veomett (Mathematics)
Ann Wells (Biological/Biomedical Sciences)
Yufei Yue (Biological/Biomedical Sciences)

Tutorial Event	Start Date	End Date
Using Bioinformatics Data and Tools to Engage Students in Problem Solving: A Curriculum Development Workshop	**07-Jan-13**	**10-Jan-13**

Ogun Adebali (Biological/Biomedical Sciences)
Nancy Boury (Biological/Biomedical Sciences)
Anya Goodman (Biological/Biomedical Sciences)
Hong Guo (Biological/Biomedical Sciences)
Edward Himelblau (Biological/Biomedical Sciences)
Suzanne Hizer (Biological/Biomedical Sciences)
Namyong Lee (Mathematics)
Matthew Macauley (Mathematics)
Sumona Mondal (Mathematics)
Jose Monterrubio (Biological/Biomedical Sciences)
Denise Monti (Biological/Biomedical Sciences)
Sandra Orchard (Not reported)
Bert Overduin (Not reported)
Dawn Reding (Biological/Biomedical Sciences)
Susan Riechert (Biological/Biomedical Sciences)
Srebrenka Robic (Biological/Biomedical Sciences)
Gabriella (Gabry) Rustici (Not reported)
Elizabeth Ryder (Biological/Biomedical Sciences)
Kai Shen (Biological/Biomedical Sciences)
Shaneka Simmons (Biological/Biomedical Sciences)
Fusheng Tang (Biological/Biomedical Sciences)
Karen Thickman (Biological/Biomedical Sciences)
Natalia Toporikova (Biological/Biomedical Sciences)
Arlin Toro (Biological/Biomedical Sciences)
John (Ioannis) Tsiligkaridis (Computer & Information Sciences)
Carmen Wright (Mathematics)
Zheyang Wu (Mathematics)
Ruijun Zhao (Mathematics)

Working Group Event	Start Date	End Date
Biotic Interactions MEETING ONE	**01-Feb-13**	**04-Feb-13**

Frederick (Fred) Adler (Biological/Biomedical Sciences)
Miguel Araujo (Biological/Biomedical Sciences)
Michael Bode (Mathematics)
Lauren Buckley (Biological/Biomedical Sciences)
George (Chris) Cosner (Mathematics)
Janet Franklin (Biological/Biomedical Sciences)
William Godsoe (Biological/Biomedical Sciences)
Nat Holland (Biological/Biomedical Sciences)
Robert Holt (Biological/Biomedical Sciences)
Henriette (Yetta) Jager (Agricultural Sciences/Natural Resources)
Jill Jankowski (Biological/Biomedical Sciences)
Bruce Kendall (Biological/Biomedical Sciences)
Otso Ovaskainen (Biological/Biomedical Sciences)
Robin Snyder (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
Cross-Topology Registration WG M4	**01-May-13**	**03-May-13**

Jay Beder (Mathematics)
Patrick Carter (Biological/Biomedical Sciences)
Daniel Gervini (Mathematics)
Richard Gomulkiewicz (Biological/Biomedical Sciences)
Nancy Heckman (Mathematics)
David Houle (Biological/Biomedical Sciences)
Eladio Marquez (Biological/Biomedical Sciences)
James (Steve) Marron (Mathematics)
Karin Meyer (Agricultural Sciences/Natural Resources)
Washington Mio (Mathematics)

Working Group Event	Start Date	End Date
Design and Analysis of Bat Population Monitoring WG MEETING ONE	**07-May-13**	**09-May-13**

Matthew Clement (Agricultural Sciences/Natural Resources)
Laura Ellison (Biological/Biomedical Sciences)
Thomas Hallam (Biological/Biomedical Sciences)
Thomas (Tom) Ingersoll (Mathematics)
Kathryn (Kathi) Irvine (Mathematics)
Douglas Johnson (Agricultural Sciences/Natural Resources)
Cori Lausen (Biological/Biomedical Sciences)
Subhash Lele (Mathematics)
Susan Loeb (Agricultural Sciences/Natural Resources)
Jonathan Reichard (Not reported)
Thomas Rodhouse (Biological/Biomedical Sciences)
Robin Russell (Agricultural Sciences/Natural Resources)
John Sauer (Biological/Biomedical Sciences)
Thomas Stanley (Agricultural Sciences/Natural Resources)
Wayne Thogmartin (Agricultural Sciences/Natural Resources)

Working Group Event	Start Date	End Date
Food Web Dynamics WG MEETING THREE	**11-Dec-12**	**14-Dec-12**

Tanguy Daufresne (Biological/Biomedical Sciences)
Dominique Gravel (Biological/Biomedical Sciences)
Jiang Jiang (Biological/Biomedical Sciences)
Christopher Klausmeier (Biological/Biomedical Sciences)
Yang Kuang (Mathematics)
Mathew Leibold (Biological/Biomedical Sciences)
Irakli Loladze (Biological/Biomedical Sciences)
Francois Massol (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
Gene Tree Reconciliation WG MEETING THREE	**26-Nov-12**	**29-Nov-12**

Lars Arvestad (Computer & Information Sciences)
Ruchi Chaudhary (Computer & Information Sciences)
Nadia El-Mabrouk (Computer & Information Sciences)
Oliver Eulenstein (Computer & Information Sciences)
Pawel Gorecki (Computer & Information Sciences)
Tony (Dwueng-Chwuan) Jhwueng (Mathematics)
Vaishali Katju (Biological/Biomedical Sciences)
Laura Kubatko (Mathematics)
Jim Leebens-Mack (Biological/Biomedical Sciences)
David Liberles (Biological/Biomedical Sciences)
Brian O'Meara (Biological/Biomedical Sciences)
Noah Rosenberg (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
Hierarchy and Leadership MEETING ONE	**25-Apr-13**	**27-Apr-13**

Monique Borgerhoff Mulder (Social Sciences)
Claire El Mouden (Biological/Biomedical Sciences)
Sergey Gavrilets (Biological/Biomedical Sciences)
Christoph Hauert (Physics)
Kim Hill (Social Sciences)
Paul Hooper (Social Sciences)
Susan Perry (Social Sciences)
Anne Pusey (Biological/Biomedical Sciences)
Eric Smith (Social Sciences)
Jennifer Smith (Biological/Biomedical Sciences)
Mark van Vugt (Psychology)
Geoff Wild (Mathematics)

Working Group Event	Start Date	End Date
Modeling Low Dose Exposure to Inhalation Anthrax WG MEETING TWO	**13-Nov-12**	**15-Nov-12**

Haas Charles (Engineering)
Judy Day (Mathematics)
Vitaly Ganusov (Health Sciences)
Philip Hanna (Biological/Biomedical Sciences)
Hyang Mi Kim (Mathematics)
Calistus Ngonghala (Mathematics)
Megan Powell (Mathematics)
Angela Reynolds (Mathematics)
Harish Shankaran (Biological/Biomedical Sciences)
Sarah Taft (Biological/Biomedical Sciences)
Judy Day (Mathematics)
Vitaly Ganusov (Health Sciences)
Philip Hanna (Biological/Biomedical Sciences)
Hyang Mi Kim (Mathematics)
Megan Powell (Mathematics)
Angela Reynolds (Mathematics)
Harish Shankaran (Biological/Biomedical Sciences)
Sarah Taft (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
Multiscale Modeling of the Life Cycle of Toxoplasma gondii WG MEETING THREE	**17-Dec-12**	**19-Dec-12**

Michael (Mike) Gilchrist (Biological/Biomedical Sciences)
Sandra Halonen (Biological/Biomedical Sciences)
Maud Lelu (Biological/Biomedical Sciences)
Suzanne Lenhart (Mathematics)
Dana Mordue (Biological/Biomedical Sciences)
Claudia Munoz-Zanzi (Health Sciences)
Benjamin Rosenthal (Biological/Biomedical Sciences)
Chunlei Su (Biological/Biomedical Sciences)
Jorge Velasco-Hernandez (Biological/Biomedical Sciences)
Xiaopeng   Zhao   (Engineering)

Working Group Event	Start Date	End Date
Nonautonomous Systems and Terrestrial Carbon Cycle MEETING ONE	**13-May-13**	**17-May-13**

Folashade Agusto (Mathematics)
Benito Chen-Charpentier (Mathematics)
Forrest Hoffman (Geological & Earth Sciences)
Maria Leite (Mathematics)
Yiqi Luo (Biological/Biomedical Sciences)
Belinda Medlyn (Agricultural Sciences/Natural Resources)
Matthew Rasmussen (Computer & Information Sciences)
Matthew Smith (Biological/Biomedical Sciences)
Yingping Wang (Geological & Earth Sciences)

Working Group Event	Start Date	End Date
Ocean Viral Dynamics WG MEETING TWO	**22-Oct-12**	**24-Oct-12**

Alison Buchan (Biological/Biomedical Sciences)
Maureen Coleman (Biological/Biomedical Sciences)
Michael (Mick) Follows (Ocean/Marine Sciences)
Jay Lennon (Biological/Biomedical Sciences)
Mathias Middelboe (Ocean/Marine Sciences)
Derek Sonderegger (Mathematics)
Charles (Charlie) Stock (Ocean/Marine Sciences)
Curtis Suttle (Ocean/Marine Sciences)
Frede (Tron) Thingstad (Ocean/Marine Sciences)
Joshua Weitz (Biological/Biomedical Sciences)
Steven Wilhelm (Biological/Biomedical Sciences)
Willie Wilson (Ocean/Marine Sciences)
Eric Wommack (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
Optimal Control for Agent-based Models WG MEETING THREE	**27-Nov-12**	**29-Nov-12**

Gary   An (Biological/Biomedical Sciences)
Scott Christley (Computer & Information Sciences)
Paula Federico (Mathematics)
Benjamin (Ben) Fitzpatrick   (Mathematics)
Franziska Hinkelmann   (Mathematics)
Andrew Kanarek (Biological/Biomedical Sciences)
Reinhard Laubenbacher   (Mathematics)
Suzanne Lenhart (Mathematics)
Rachael Miller Neilan (Mathematics)
Rene Salinas (Mathematics)
Jie Xiong   (Mathematics)

Working Group Event	Start Date	End Date
Play, Evolution, and Sociality WG MEETING TWO	**29-Oct-12**	**31-Oct-12**

Jeremy Auerbach (Mathematics)
Gordon Burghardt (Biological/Biomedical Sciences)
Giada Cordoni (Biological/Biomedical Sciences)
Sigrunn Eliassen (Biological/Biomedical Sciences)
Hillary Fouts (Social Sciences)
Andrew Kanarek (Biological/Biomedical Sciences)
Brian O'Meara (Biological/Biomedical Sciences)
Elisabetta Palagi (Biological/Biomedical Sciences)
Sergio Pellis (Biological/Biomedical Sciences)
Jeffrey Schank (Social Sciences)
Masaki Shimada (Biological/Biomedical Sciences)

Stephen Siviy (Biological/Biomedical Sciences)
Barbara Smuts (Biological/Biomedical Sciences)
Marek Spinka (Biological/Biomedical Sciences)

Working Group Event	Start Date	End Date
'Pretty Darn Good' Control: extensions of optimal control for ecological systems WG MEETING THREE	**22-Jan-13**	**24-Jan-13**

Paul Armsworth (Biological/Biomedical Sciences)
Michael Bode (Mathematics)
Iadine Chades (Biological/Biomedical Sciences)
Megan Donahue (Biological/Biomedical Sciences)
Alan Hastings (Mathematics)
Mandy Karnauskas (Biological/Biomedical Sciences)
Jacob LaRiviere (Social Sciences)
Claire Paris (Ocean/Marine Sciences)
Daniel (Dan) Ryan (Mathematics)
James (Jim) Sanchirico (Social Sciences)
Carl   Toews (Mathematics)

Working Group Event	Start Date	End Date
Suction Feeding Biomechanics WG MEETING TWO	**29-Oct-12**	**30-Oct-12**

Steven Day (Engineering)
Alice Gibb (Biological/Biomedical Sciences)
Patricia (Luz) Hernandez (Biological/Biomedical Sciences)
Tim Higham (Biological/Biomedical Sciences)
Roi Holzman (Biological/Biomedical Sciences)
Christopher (Darrin) Hulsey (Biological/Biomedical Sciences)
Matthew McHenry (Biological/Biomedical Sciences)
Sam Van Wassenbergh (Biological/Biomedical Sciences)
Peter Wainwright (Biological/Biomedical Sciences)
Jeannette Yen (Ocean/Marine Sciences)

Working Group Event	Start Date	End Date
Suction Feeding Biomechanics WG MEETING THREE	**20-May-13**	**21-May-13**

Greg Burgreen (Engineering)
Steven Day (Engineering)
Alice Gibb (Biological/Biomedical Sciences)
Patricia (Luz) Hernandez (Biological/Biomedical Sciences)
Tim Higham (Biological/Biomedical Sciences)
Roi Holzman (Biological/Biomedical Sciences)
Christopher (Darrin) Hulsey (Biological/Biomedical Sciences)
Matthew McHenry (Biological/Biomedical Sciences)
Sam Van Wassenbergh (Biological/Biomedical Sciences)
Peter Wainwright (Biological/Biomedical Sciences)
Jeannette Yen (Ocean/Marine Sciences)

Working Group Event	Start Date	End Date
Within-host Modeling of Mycobacterium avium subsp. paratuberculosis (MAP) Infections WG MEETING TWO	**04-Mar-13**	**06-Mar-13**

Shigetoshi Eda (Agricultural Sciences/Natural Resources)
Dieudonne (Don) Klinkenberg (Health Sciences)
Ad Koets (Biological/Biomedical Sciences)
Suzanne Lenhart (Mathematics)
Yoram Louzoun (Mathematics)
Gesham Magombedze (Mathematics)
Maia Martcheva (Mathematics)
Rebecca Mitchell (Biological/Biomedical Sciences)
Eiichi Momotani (Agricultural Sciences/Natural Resources)
Ynte Schukken (Health Sciences)

Addendum to NIMBioS Annual Report

Sep 1, 2012 –Aug 31, 2013

Y5-4. Description of Activities

Description of Major Activities September 1, 2012 – August 31, 2013

Over the reporting period from September 1, 2012 through August 31, 2013, NIMBioS hosted 19 meetings of 15 different Working Groups (two joint working groups held two additional meetings offsite), 2 Investigative Workshops, 3 Tutorials, an Undergraduate Research Conference, a Research Experience for Undergraduates program, and a Summer Graduate School Workshop. There were a total of 695 participants in NIMBioS-hosted activities during this period with 19 Postdoctoral Fellows in residence, 3 Sabbatical Fellows and 39 Short-term Visitors.

Demographics data on all participants at events from September 1, 2012 through May 31, 2013 are presented in detail in the NIMBioS Evaluation Report (see section Y5-2 of the addendum to this Annual Report). There were 545 participants through May 31, 2013 from 23 countries and 41 U.S. states as well as the District of Columbia and Puerto Rico representing 204 different institutions. International participants amounted to 14% of all participants. Most participants were college or university faculty (51%), but undergraduates (16%), post-doctoral researchers (14%), and graduate students (6%) accounted for a significant number. Across all events the gender ratio was 61% male to 39% female, and minority representation was near 11%. Representation of various minority categories was on par with current trends in minority representation for doctoral recipients in the biological sciences, and greater than that in the mathematical sciences. Short-term Visitors were from 37 different institutions and collaborated with NIMBioS post-doctoral and sabbatical fellows, faculty from six University of Tennessee departments, and 16 researchers external to NIMBioS/Univ. Tennessee.

Below is a short description of each of the Working Groups, Investigative Workshops, and Tutorials held September 1, 2012 – August 31, 2013 as well as a listing of short-term visitors and their projects. A listing of participants in each activity is provided Section Y5-3 of this addendum.

WORKING GROUPS

Working Group on Ocean Viral Dynamics
http://www.nimbios.org/workinggroups/WG_ocean_viral_dyn
Organizers: Joshua S. Weitz, Theoretical Ecology, School of Biology & Physics, Georgia Inst. of Technology, Atlanta; Steven W. Wilhelm, Microbiology, Univ. of Tennessee, Knoxville
The goal of this working group is to identify and devise analytical approaches to quantifying viral effects on the biogeochemical dynamics of carbon and other key nutrients in the oceans.
Meeting dates: October 2012, June 2013

Working Group on Suction Feeding Biomechanics
http://www.nimbios.org/workinggroups/WG_suctionfeeding
Organizers: Peter Wainwright, Dept. of Evolution & Ecology, Univ. of California, Davis; Steven Day, Dept. of Mechanical Engineering, Rochester Institute of Technology, Rochester, NY
The overarching goal of this group is to develop comprehensive and accessible predictive mathematical models of prey capture performance based on suction feeding biomechanics that better integrate musculo-skeletal dynamics with predator induced water flows and prey sensory mechanics.
Meeting dates: October 2012, May 2013

Working Group on Play, Evolution and Sociality

http://www.nimbios.org/workinggroups/WG_play
Organizers: Gordon M. Burghardt, Depts. of Psychology and Ecology & Evolutionary Biology, Univ. of Tennessee, Knoxville; Marc Mangel, Dept. of Applied Mathematics and Statistics, Jack Baskin School of Engineering, Univ. of California, Santa Cruz; Elisabetta Palagi, Centro Interdipartimentale Museo di Storia Naturale e del Territorio, Università di Pisa, Pisa, Italy and Unit of Cognitive Primatology and Primate Center, Institute of Cognitive Sciences and Technologies, The National Research Council (CNR), Rome, Italy; Sergio M. Pellis, Canadian Centre for Behavioural Neuroscience, Dept. of Neuroscience, Univ. of Lethbridge, Lethbridge, Alberta, Canada
The goals of this group are to use mathematical tools to uncover the factors predicting the dynamics, occurrence and trajectory of play in diverse taxa and the ecological, physiological and life history factors that facilitate and maintain it.
Meeting date: October 2012

Working Group on Modeling Anthrax Exposure
http://www.nimbios.org/workinggroups/WG_anthrax
Organizers: Judy Day, Mathematics, Univ. of Tennessee, Knoxville; Sarah Taft, US Environmental Protection Agency, Office of Research and Development, Cincinnati, Ohio
This group will will focus on developing mathematical models that are closely integrated with experimental data to answer questions related to low dose exposure to inhalation anthrax. The goal is a better understanding of the human health effects specifically to low dose exposures of residual or reaerosolized *B. anthracis* spores after a potential event.
Meeting date: November 2012, May 2013

Working Group on Gene Tree and Species Tree Reconciliation
http://nimbios.org/workinggroups/WG_genetree_reconciliation
Organizers: Gordon Burleigh, Department of Biology, University of Florida; Oliver Eulenstein, Department of Computer Science, Iowa State University; David Liberles, Department of Molecular Biology, University of Wyoming
This group aims to define and characterize the statistical, algorithmic and computational problems associated with gene tree/species tree reconciliation and to apply solutions to these problems to infer patterns and processes of gene duplication and loss from large-scale comparative genomic data sets.
Meeting date: November 2012

Working Group on Optimal Control for Agent-based Models
http://nimbios.org/workinggroups/WG_ABMs
Organizers: Gary An, University of Chicago Pritzker School of Medicine; Reinhard Laubenbacher, Virginia Bioinformatics Institute; Suzanne Lenhart, Deparment of Mathematics, University of Tennessee; Jie Xiong, Department of Mathematics, University of Tennessee
Building on a NIMBioS Investigative Workshop held in December 2010, this working group is exploring mathematical and control/optimization frameworks and tools for agent-based/individual-based models.
Meeting date: November 2012

Working Group on Food Web Dynamics and Stoichiometric Constraints in Meta-Ecosystems
http://www.nimbios.org/workinggroups/WG_FoodWebs
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.
Meeting date: December 2012

Working Group on Multi-scale Modeling of the Life Cycle of *Toxoplasma gondii*
http://www.nimbios.org/workshops/WS_Toxoplasma.html
Organizers: Zhilian Feng, Department of Mathematics, Purdue University; Dana Mordue, Department of Microbiology and Immunology, New York Medical College; Chunlei Su, Department of Microbiology, University of Tennessee; Xiaopeng Zhao, Department of Biomedical Engineering, University of Tennessee
Building on a NIIMBioS Investigative Workshop held in May 2010, this working group aims to develop a mathematical framework to understand within-host infection dynamics; to explore new mathematical models to investigate the characteristics of the complex transmission pathways of T. gondii; and to integrate within-host and between-host models to understand the influences of various properties of the parasites on their genetic diversities and bio-geographic patterns.
Meeting dates: December 2012, July 2013

Working Group: 'Pretty Darn Good' Control: Extensions of Optimal Control for Ecological Systems
http://nimbios.org/workinggroups/WG_PDG
Organizers: Megan Donahue, Hawaii Inst. of Marine Biology, Univ. of Hawaii, Kaneohe; Carl Toews, Dept. of Mathematics, Duquesne Univ., Pittsburgh, PA; Alan Hastings, Dept. of Environmental Science and Policy. Univ. of California, Davis; Paul Armsworth, Dept. of Ecology and Evolutionary Biology, Univ. of Tennessee, Knoxville
This group focuses on three practical concerns that complicate straightforward applications of optimal control: model uncertainty, objective uncertainty, and control constraints. Using a problem-based approach, the group considers examples in fisheries management, marine spatial planning, life-history evolution, and ecosystem dynamics, but the techniques being developed apply to biological systems much more broadly.
Meeting date: January 2013

Working Group: When are biotic Interactions necessary to model species distributions?
http://www.nimbios.org/workinggroups/WG_biotic_interactions
Organizers: William Godsoe, School of Biological Sciences, Univ. of Canterbury, Christchurch, New Zealand, and Robert D. Holt, Univ. of Florida, Gainesville.
This working group seeks to formally link ecological theory on species interactions to empirical species' distribution models as a strong understanding of distributions is essential to making predictions about the distribution of biodiversity and biosecurity threats. They are investigating the relative importance of species interactions and the abiotic environment at large spatial scales, determining whether omitting some species interactions (e.g. predation) produces poorer inferences than omitting other interactions (e.g. competition), and identifying the conditions under which the effects of species interactions must be separated from dispersal and population stochasticity.
Meeting date: February 2013

Working Group on Within-host Modeling of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) Infections
http://www.nimbios.org/workinggroups/WG_map

Organizers: Ynte H. Schukken, Cornell Univ., Ithaca, NY.; Ad Koets, Utrecht Univ., the Netherlands; Srinand Sreevatsan, Univ. of Minnesota; Maia Martcheva, Univ. of Florida; Shigetoshi Eda, Univ. of Tennessee
This group is an outgrowth of the 2011 NIMBioS Investigative Workshop on Modeling Johne's Disease. The objective of the group is to develop a within-host MAP infection model, using observational data on infection patterns and within-host immune response data. The ultimate goal of the model is to provide an understanding of progression of disease in response to MAP infection and to devise better mitigation strategies for Johne's disease.
Meeting date: March 2013

Working Group on Emergence of Hierarchy and Leadership in Mammalian Societies
http://www.nimbios.org/workinggroups/WG_leadership
Organizers: Eric Alden Smith, Dept. of Anthropology, Univ. of Washington, Claire El Mouden, Dept. of Zoology, Univ. of Oxford, Sergey Gavrilets, Depts. of Ecology & Evolutionary Biology and Mathematics, Univ. of Tennessee
The goal of the working group is to analyze factors favoring the emergence of leadership and hierarchies (and resultant inequality in power, resources, and reproductive outcomes) across a range of animal species and humans. Of particular interest to the working group is the transition from systems where differences in power are based on individual characteristics or kin-based alliances to ones with hierarchical structures and clear leadership roles that extend beyond dyadic dominance relations and kinship ties. The working group effort will involve a combination of advanced modeling efforts (based on game-theoretic, population genetics, behavioral ecology, and agent-based models) and empirical synthesis. The aim of the working group is to produce a series of high-impact collaborative research papers that would be of interest to researchers in multiple disciplines.
Meeting date: April 2013

Working Group on Darwinian Morphometrics: Cross-Topology Registration of Shape
http://www.nimbios.org/workinggroups/WG_ct_registration.html
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.
Meeting date: May 2013

Working Group: Acting locally and modeling globally: developing a comprehensive modeling strategy for estimating trends in North American bat species distributions and abundances (Design and Analysis of Bat Population Monitoring)
http://www.nimbios.org/workinggroups/WG_bats
Organizers: Susan C. Loeb, U.S. Forest Service, Southern Research Station; Thomas Ingersoll, Department of Defense; Jeremy Coleman, U.S. Fish and Wildlife Service; Laura Ellison, U.S.G.S., Fort Collins Science Center; Thomas Rodhouse, NPS Upper Columbia Basin Inventory and Monitoring Network.

The objective of this NIMBioS working group is to draft a coherent model-based analytical framework that can enable bat occurrence and abundance data collected across broad geographic regions to be synthesized into robust, statistically-defensible assessments of population trend and extinction risk. The geographic scope, the multi-scale nature of the anticipated design structure, and the need to incorporate data collected under different protocols and methodologies, including occurrence and count data, create a very challenging statistical and analytical setting.
Meeting dates: February 2013 at USGS-Fort Collins Science Center; May 2013 at NIMBioS

Working Group: Nonautonomous linear system of the terrestrial C-cycle: Mathematical and ecological properties and their uses in guiding carbon research.
http://www.nimbios.org/workinggroups/WG_ccycle
Organizers: Yiqi Luo, Dept. of Microbiology and Plant Biology, University of Oklahoma, Norman, OK; Maria Leite, Dept. of Mathematics and Statistics, The University of Toledo
This working group examines theoretical properties of the nonautonomous linear system of the terrestrial carbon cycle and explores uses of those properties to guide observatory, experimental, and modeling research. This group also has the potential to make seminal contributions to establish theoretical ecosystem ecology as a subdiscipline in ecology.
Meeting date: May 2013

Working Group: Integrating human risk perception of global climate change into dynamic earth system models (Joint activity with SESYNC)
http://www.nimbios.org/workinggroups/WG_risk
Organizers: Brian Beckage, Plant Biology, Univ. of Vermont; Louis Gross, NIMBioS and Univ. of Tennessee; Asim Zia, Community Development and Applied Economics, Univ. of Vermont.
The integrative, multidisciplinary team in this working group is considering feedbacks between climate, ecological, and human belief systems using a quantitative modeling approach.
Meeting date: June 2013 at SESYNC

WORKSHOPS

Investigative Workshop: Systems and Synthetic Biology of Microbial Systems
http://www.nimbios.org/workshops/WS_ss_micro
Organizers: Christopher Rao, Dept. of Chemical and Biomolecular Engineering, Univ. of Illinois; Lingchong You, Dept. of Biomedical Engineering and Institute for Genome Sciences and Policy, Duke Univ.
The goal of this investigative workshop was to bring together researchers dealing with modeling and experimental analysis of microbial systems using natural or engineered systems. Cutting across the diversity of the experimental systems, tools, and modeling approaches, is the common notion of using these systems as well defined models that allow highly controlled experimentation. Such analysis in turn has the potential to generate definitive and often times generally applicable insights into issues including network design principles, ecological interactions, and evolution of cooperative traits.
Meeting date: March 2013

Investigative Workshop: Modeling Blood Cell Interactions
http://www.nimbios.org/workshops/WS_bci
Organizers: Damir B. Khismatullin, Dept. of Biomedical Engineering, Tulane Univ.; George Em Karniadakis, Division of Applied Mathematics, Brown Univ.; Konstantinos Konstantopoulos, Dept. of Chemical and Biomolecular Engineering, Johns Hopkins Univ.

The blood of human and other vertebrates contains a large number of individual, circulating cells. The interactions of these cells with each other and with the internal lining of blood vessels (vascular endothelium) are a key factor in maintaining body homeostasis, including adequate delivery of oxygen to body tissues, protection of the body against invading pathogens and defective cells, and plugging vascular wounds by blood clots. Mathematical modeling of the interactions of blood cells is a challenging, multifaceted, and multi-scale problem that can be appropriately solved only through integration of knowledge across several disciplines such as cell biology, physiology, biophysics, engineering, and mathematics. The Modeling Blood Cell Interactions (MBCI) workshop brought together experts from these disciplines to share their recent progress in the investigation of blood cell interactions.
Meeting date: June 2013

Summer Graduate Workshop: Connecting Biological Data with Mathematical Models
http://www.nimbios.org/education/WS_grad2013
Organizing committee: Ben Bolker (McMaster University); Ariel Cintron-Arias (East Tennessee State University); Marisa Eisenberg (University of Michigan, Ann Arbor); Gregor Fussmann (McGill University); Suzanne Lenhart (NIMBioS and University of Tennessee, Knoxville); Brian Leung (McGill University); Russell Zaretzki (University of Tennessee, Knoxville)
This graduate workshop had instructors from across North America whose research expertise is mathematical modeling in biological systems using real data. It included lectures on techniques and modeling using specific data sets, and daily computer activities focusing on learning techniques. In addition, each student worked on a research project over the duration of the program with a team of four or five participants.
Meeting date: June 2013

TUTORIALS

Tutorial: Using Bioinformatics Data and Tools to Engage Students in Problem Solving: A Curriculum Development Workshop
http://www.nimbios.org/tutorials/TT_curriculum_dev2013
This workshop focused on strategies for bringing bioinformatics resources, data visualization tools, and an interdisciplinary perspective to teaching and learning biology and for participants interested in incorporating research data and tools into their undergraduate biology courses. The program featured a series of opportunities to get hands-on experience working with publicly accessible research data to solve biological problems, supplemented with research talks by local speakers. Focus areas included strategies for teaching with big datasets, using proteomics and functional genomics resources, visually exploring data, and accessing online databases. Participants also had the chance to work collaboratively to create a curriculum project for use in their own teaching. The tutorial was the result of a collaboration between NIMBioS, SCALE-IT, the BioQUEST Curriculum Consortium, and the European Bioinformatics Institute.
Meeting date: January 2013

Tutorial: Mathematical Modeling for the Cell Biology Researcher and Educator
http://www.nimbios.org/tutorials/TT_vcell
Organizers: Leslie Loew (Director, Center for Cell Analysis and Modeling, University of Connecticut Health Center); Huaiyu Mi (Division of Bioinformatics, Department of Preventive Medicine, Keck School of Medicine of USC); Michael Blinov (Center for Cell Analysis and Modeling, University of Connecticut Health Center); Sofya Borinskaya (University of Connecticut Health Center); Raquell Holmes (Center for Cell Analysis and Modeling, University of Connecticut Health Center; Founder, Improvscience)

This tutorial taught participants how to use computational resources for mathematical modeling and simulation of kinetic networks in spatial context. It introduced the mathematical foundations of reaction kinetics and different simulation techniques. By the conclusion of the tutorial, participants had learned the skills needed to build and simulate models of reaction networks, e.g. ligand-induced signaling cascade. Three approaches to creating reaction network models were demonstrated: designing reaction schema, importing pathway information from biological databases (such as Panther or Pathway Commons collection), and using rule-based modeling. The Virtual Cell modeling and simulation platform was used to perform simulations, and tools providing a broad coverage of techniques used in mathematical modeling in cell biology were presented.
Meeting date: April 2013

Workshop for Graduate Students: Introduction to Population Wildlife Disease Modeling
Leaders: Shigetoshi Eda, Cristina Lanzas, Suzanne Lenhart, Rene Salinas and Kelly Sturner
This workshop, hosted by NIMBioS as part of the 62nd International Conference of the Wildlife Disease Association, focused on introducing graduate and advanced undergraduate students in how to develop population scale epidemiological models with examples from wildlife diseases in North America.
Meeting date: July 2013

SHORT-TERM VISITORS

Klaas Hartmann (Institute for Marine and Antarctic Studies, Univ. of Tasmania) visited NIMBioS to collaborate with Dr. Paul Armsworth on the theoretical implications of marine protected areas on global greenhouse emissions resulting from food production. (September 11-23, 2012)

John Bruno (Marine Sciences, Univ. of North Carolina Chapel Hill) and Jennifer Cooper (Biological Sciences, Univ. of Liverpool) visited NIMBioS to collaborate with NIMBioS Sabbatical Fellow Matt Spencer to develop new quantitative methods with which to make sense of large biological and environmental datasets and to project possible consequences of global environmental change on coral reef communities. (Dr. Cooper: October 1-7, 2012; Dr. Bruno: October 3-5, 2012)

Heather Briggs (Environmental Studies, UC Santa Cruz) visited NIMBioS to collaborate with Dr. Paul Armsworth on a project to expand models of pollinator networks to incorporate interaction strength and interaction directionality in investigations of plant community resilience. (Nov. 8-15, 2012)

Simon Levin (Biology, Princeton Univ.) visited NIMBioS and gave a seminar talk as a Post-doctoral Fellows Invited Distinguished Visitor. (Nov. 12-13, 2012)

Angela Reynolds (Mathematics, Virginia Commonwealth Univ.) visited NIMBioS to collaborate with Dr. Judy Day on projects related to the Working Group on Modeling Anthrax Exposure. (Nov. 16-18, 2012)

Linda Allen (Mathematics and Statistics, Texas Tech Univ.) and Vrushali Bokil (Mathematics, Oregon State Univ.) visited NIMBIoS to collaborate with Dr. Suzanne Lenhart and Dr. Reza Hajimorad on a project to formulate deterministic and stochastic models for plant-pathogen systems. (Dec. 10-20, 2012)

Dan Blumstein (Ecology & Evolutionary Biology, UCLA) visited NIMBioS to collaboration with Dr. Arik Kershenbaum, Dr. Amiyaal Ilany and Dr. Todd Freeberg on a project to explore the relationship between group size and individual distinctiveness in vocalizations of songbirds. (January 15-18, 2013)

Kailin Kroetz (Resource Economics & Policy Lab at UC Davis) visited NIMBioS to collaborate with Dr. Paul Armsworth on a project to compare the effectiveness of conservation strategies that employ more democratic methods of control versus those that focus on a more centralized, top-down approach. (January 23-28, 2013)

Michael Bode (Botany, Univ. of Melbourne) visited NIMBioS to collaborate with Dr. Paul Armsworth advancing a project investigating the optimal resolution of spatial management in ecosystems with complex dispersal patterns in preparation for discussion at the NIMBioS Working Group Pretty Darn Good Control: Extensions of optimal control for ecological systems. (January 25-31, 2013)

Helene Muller-Landau (Center for Tropical Forest Science, Global Forest Carbon Research Initiative, Smithsonian Tropical Research Institute) visited NIMBioS and gave a seminar as a NIMBioS Postdoctoral Fellows Invited Distinguished Visitor. (January 28-31, 2013)

Philip Maini (Centre for Mathematical Biology, Mathematical Institute, Univ. of Oxford) visited NIMBioS to talk with NIMBioS postdoctoral fellows. (February 8-9, 2013)

Kamuela Yong (School of Mathematics & Statistical Sciences, Arizona State Univ.) visited NIMBioS to give a talk and meet with faculty and postdoctoral fellows to discuss agent-based models for vector-borne diseases and to discuss ideas about modeling biodiversity in river systems. (February 21-22, 2013)

Ludek Berec (Theoretical Ecology, Institute of Entomology, Biology Centre, Academy of Sciences of the Czech Rep.) visited NIMBioS and gave a seminar as a NIMBioS Postdoctoral Fellows Invited Distinguished Visitor. (February 25-28, 2013)

Patrick Ayscue (College of Veterinary Medicine, Cornell Univ.) visited NIMBioS to collaborate with Dr. Cristina Lanzas to develop pathogen-scale models in an ecological metapopulation framework. (Feb. 25-March 1, 2013)

Gary An (Surgery, Univ. of Chicago School of Medicine), Reinhard Laubenbacher (Virginia Bioinformatics Institute, Virginia Tech), and René Salinas (Mathematical Sciences, Appalachian State Univ.) visited NIMBioS to collaborate with Dr. David Gurarie, Dr. Suzanne Lenhart, Dr. Louis Gross and Dr. Andrew Kanarek on projects related to the Working Group on Optimal Control of Agent-based Models. (April 1-3, 2013)

Lisa Sattenspiel (Anthropology, Univ. of Missouri, Columbia) and Alan Swedlund (Anthropology, Univ. of Massachusetts) visited NIMBioS to give a seminar talk and collaborate on a project to develop model structures for integrating population processes and environmental constraints at both household and individual levels, consider role of infectious disease in population change, and develop possible working group/workshop request dealing with these topics related to the Long House Valley project. (April 10-13, 2013)

Karoun Bagamian (Geography/Emerging Pathogens Institute, Univ. of Florida), Mac Hyman, Math/Center for Computational Sciences, Tulane Univ., and Carrie Manore (Math/Center for

Computational Sciences, Tulane Univ.) visited NIMBioS to collaborate on a project to adapt an agent-based model for deer mouse behavior and hantavirus transmission. (April 10-13, 2013)

Tom Currie (Human Evolutionary Ecology Research Group, Univ. College London) visited NIMBioS to collaborate with Dr. Sergey Gavrilets to construct a mathematical model to assess alternative theories of the evolution of social complexity. (April 14-17, 2013)

Benito Chen (Math, Univ. of Texas Arlington) and Maria Leite (Math & Statistics, Univ. of Toledo) visited NIMBioS to collaborate on a project to develop a model to study the effect of fires on the pine bark beetle and pine plantations. (May 18-25, 2013)

Ruijun Zhao (Math & Statistics, Minnesota State Univ.) and Jemal Mohammed-Awel (Math & Computer Sci, Valdosta State Univ.) visited NIMBioS to collaborate with Dr. Calistus Ngonghala to develop mathematical models to study control strategies of parasitic diseases. (May 27-31, 2013)

Jeremy Karnowski (Cognitive Science, UC San Diego) visited NIMBioS to collaborate with Dr. Arik Kershenbaum and Dr. Todd Freeberg on a project to analyze the structure of dolphin signature whistles. (June 14-July 24, 2013)

Andrew C. Eller, Jr., formerly with the South Florida Ecological Services Office of the U.S. Fish and Wildlife Service, visited NIMBioS to collaborate with Jane Comiskey on a project to design and parameterize a spatially-explicit species index model for Florida panthers. (June 21-July 2, 2013)

Erin Bodine (Mathematics & Computer Science, Rhodes College) visited NIMBioS to collaborate with Dr. Louis Gross and Dr. Suzanne Lenhart to revise the Mathematics for the Life Sciences textbook and also to collaborate with Dr. Marco Martinez on a project to determine optimal augmentation strategies for threatened populations. (July 9-19, 2013)

Cécile Gotteland (Ecology, Univ. Lyon) visited NIMBioS to collaborate with Dr. Maud Lelu and Dr. Xiaopeng Zhao on a project linking biological data to a mathematical approach to predict parasite transmission. (July 12- Aug 3, 2013)

Matthew Glomski (Mathematics, Marist College) and Olivia Brozek (Mathematical Sciences, George Mason Univ.) visited NIMBioS to collaborate with Dr. Calistus Ngonghala on a project to analyze a complex compartmental epidemiological model for Marburd hemorrhagic fever. (July 24-30, 2013)

Alda Pires (College of Veterinary Medicine, Michigan State Univ.) visited NIMBioS to collaborate with Dr. Cristina Lanza on a project to develop models of Salmonella transmission involving high-shedding pig herds. (July 28-Aug. 3, 2013)

Brian Beckage (Plant Biology, Univ. of Vermont) visited NIMBioS to collaborate with Dr. Louis Gross on a project to develop models to link human behavioral systems to the ecological and climate systems in a coupled earth system model. (Aug. 4- 8, 2013)

Katia Vogt Geisse (Mathematics, Purdue Univ.) visited NIMBioS to collaborate with Dr. Calistus Ngonghala on a project to develop a mathematical model for malaria that incorporates the vaccine RTS, S. (Aug. 14-24, 2013)

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Y5-5. Additional Products

Presentations

Grants/Proposals

Media Coverage

Featured Articles

Meetings/Workshops/Symposiums

PRESENTATIONS

Duenez-Guzman EA, Vose AD, Vose MD, Gavrilets S. 2009. Simulating population genetics on the XT5. Compute the Future Cray Users Group conference, Atlanta, GA.

Gonzalez-Parra P. 2009. Poster: Computational methods for infectious diseases. Bioinformatics Conference, Albuquerque, NM.

Gonzalez-Parra P. 2009. The role of travel treatment and social distancing: The case of influenza in Mexico 2009. SIAM National Conference, Denver, CO.

Post BK, Riechert SE. 2009. Bridging the gap: Connecting biology and engineering in the high school curriculum. The ASEE Southeast Section Conference, Southern Polytechnic State University, Marietta, G.

Kobayashi I. April 2009. Selfish genes vs. genome society: dynamics in bacterial genome evolution. National Cancer Institute, Bethesda, MD.

Horan RD, Xepapadeas A. July 2009. Coevolution of livestock diseases and management choices. Agricultural and Applied Economic Association 2009 Annual Meeting, Milwaukee, WI.

Xie F, Horan RD, Wolf CA, Mathews K. July 2009. A gravity model of bovine TB in the US. Agricultural and Applied Economic Association 2009 Annual Meeting, Milwaukee, WI.

Gonzalez PA, Velazquez L, Argaez M, Castillo-Chavez C, Fenichel E. March 2009. Computational methods in infectious diseases. Genetics: Traits Disease and Variant Discovery, Santa Fe, NM.

Bodine EN. November 2009. Graduate Student Forum LaTeX Series: Beamer Presentations. Graduate Student Forum Seminar, Mathematics Department, University of Tennessee, Knoxville, TN.

Velasco-Hernandez JX. November 2009. Un modelo matematico SEIR con aislamiento social. VI Congreso Latinoamericano de Biologia Matematica Acapulco Guerrero.

Bodine EN. October 2009. Graduate Student Forum LaTeX Series: Graphics & Bibliographies. Graduate Student Forum Seminar, Mathematics Department, University of Tennessee, Knoxville, TN.

Kobayashi I. October 2009. Selfish genes vs. genome: Roles of selfish Dnase genes programming deaths. 17th Annual Microbial Genomics Conference, Rocky Gap State Park, MD.

Abu-Khzam FN, Fernau H, Langston MA, Lee-Cultura S, Stege U. 2010. A fixed-parameter algorithm for string-to-string correction. Computing: the Australasian Theory Symposium, Brisbane, Australia.

Bewick S, Onami T. 2010. Growth detection: A mechanism for immune system decision-making. AIA Annual Meeting, Baltimore, MD.

Bewick S, Onami T. 2010. Growth detection: A mechanism for immune system decision-making. SIAM Annual Meeting, Pittsburgh, PA.

Bewick S, Stuble KL, Dunn R, Sanders N. 2010. Regulation of seasonal cycles in a warming world. XVI International Union for the Study of Social Insects (IUSSI) Interational Congress, Copenhagen, Denmark.

Mao Y. 2010. Network modeling of proteins: Dynamical and evolutionary perspectives. International Conference on Network Science, Boston, MA.

Massaro T, Yang G. 2010. Using a system of difference equations to examine the relative effectiveness of a test and cull management strategy with the new EVELISA testing versus commercial ELISA testing. 2010 Undergraduate Research Conference at the Interface of Mathematics and Biology.

Gonzalez PA, Velazquez L, Villalobos C, Castillo-Chaves C. April 2010. On a parameter estimation technique for solving an Influenza Model. 7th NMSU/UTEP Workshop on Mathematics, Computer Science and Computational Sciences, New Mexico State University, Las Cruces, NM.

Seal J, Alverdy J, Babrowski T, Fink D, Romanowski K, Zaborina O, An G. April 2010. Mechanistic computational representation of pathogen response to microenvironment changes during host stress. 30th Annual Meeting of the Surgical Infection, Las Vegas, NV.

Thibert-Plante X, Hendry AP. 6 April 2010. Under what conditions can natural selection cause divergence at neutral loci? Ecology and Evolutionary Biology Seminar, Knoxville, TN.

An G. August 2010. Facilitating knowledge instantiation with agent-based modeling: Towards an ecological paradigm for biomedical research. Computational Institute Seminar Series, Chicago, IL.

An G, Colasanti R. August 2010. Studies of cellular movement using computational cellular ethology. 2010 q-Bio Conference, Santa Fe, NM.

Thibert-Plante X, Hendry AP. 29 August – 4 September 2010. When can ecological speciation be detected with neutral loci? Methods of Empirical Speciation Research, Kastanienbaum, Switzerland.

Agusto FB. 30 August – 1 September 2010. Avian influenza optimal seasonal vaccination therapy. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH.

Agusto FB. 230 August – 1 September 2010. Mathematical analysis of a model for the transmission dynamics of bovine tuberculosis. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH.

Bewick S, Onami T. 30 August – 1 September 2010. Growth detection: A mechanism for immune system decision-making. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH.

Agusto FB. December 2010. Mathematical analysis of a model for the transmission dynamics of bovine tuberculosis. 7th International Conference on Differential Equations and Dynamical Systems, University of South Florida, Tampa, FL.

Dorazio RM, Connor EF. December 2010. Estimating patterns of co-occurrence in species abundances using point counts and foraging guilds. 15th International Biometric Conference, Florianopolis, Brazil.

Davilia AA, An G. February 2010. An agent-based model of liver damage, inflammation, and repair: In silico translation of cellular and molecular mechanisms to the clinical phenomena of cirrhosis using netlogo 5th Annual Academic Surgical Congress, San Antonio, TX.

Kunz TH, Frick WF, Pollock J, Reynolds RS. February 2010. Impact of white-nose syndrome on ecosystem services provided by insectivorous bats. 2nd Berlin Bat Meeting: Bat Biology and Infectious Diseases, Berlin, Germany.

Kurahasi C, An G. February 2010. Examining the spatial dynamics of the inflammatory response with topographical metrics in an agent-based computational model of inflammation and healing. 5th Annual Academic Surgical Congress, San Antonio, TX.

Seal JB, Alverdy JC, An G. February 2010. Mechanistic computational representation of iron metabolism in the gut milieu. 5th Annual Academic Surgical Congress, San Antonio, TX.

Sheth KR, An G. February 2010. In silico translation of cellular and molecular mechanisms to clinical phenomena in atheroma development with an agent based model. 5th Annual Academic Surgical Congress, San Antonio, TX.

Wandling M, An G. February 2010. Multi-scale dynamic knowledge representation of pulmonary inflammation with an agent-based model: From gene regulation to clinical phenomenon. 5th Annual Academic Surgical Congress, San Antonio, TX.

Agusto F, Lenhart S. 9 February 2010. Optimal control of the spread of malaria super-infectivity. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Bodine EN. January 2010. Discrete time optimal control of species augmentation. Mathematics Association of America - Southeastern Sectional Meeting, Elon College.

Seal JB, Alverdy JC, Zaborina O, Zaborin A, Babrowski T, Romanowski K, An G. January 2010. Computational mechanistic representation of phosphate sensing and virulence activation in pseudomonas aeruginosa in the gut milieu. 39th Annual Critical Care Congress of the Society of Critical Care Medicine, Miami Beach, FL.

Agusto F. July 2010. Optimal control of the spread of malaria super-infectivity. Minisymposium on Applications of Control in Biology, SIAM Annual Meeting, Pittsburgh, PA.

Gonzalez-Parra P, Velazquez L, Villalobos C, Castillo-Chavez C. July 2010. Optimal control applied to a discrete influenza model. XXXVI International ORAHS Conference, Genova, Italy.

Xie F, Horan RD. July 2010. Poster: Optimal control of brucellosis in bison in the Yellowstone National Park Area. Agricultural and Applied Economic Association 2010 Annual Meeting, Denver, CO.

An G. June 2010. Agent-based dynamic knowledge representation as an evolutionary paradigm for biomedical research. Institute on Systems Science and Health, Columbia University, New York City, NY.

Horan RD, Melstrom RT. June 2010. No sympathy for the devil: Comparing test-and-removal versus test-and-translocation strategies for disease management. World Congress of Environmental and Resource Economists, Montreal, CA.

Swaroop M, An G. June 2010. Cell-level agent-based model of renal function and acute tubular necrosis. 33rd Annual Conference on Shock, Portland, OR.

An G, Colasanti R, Barua J. March 2010. Poster: Automated ontology integration within a agent-based modeling framework for executable knowledge representation. 2010 AMIA Summit for Translational Bioinformatics, San Francisco, CA

Velasco-Hernandez JX. March 2010. Un modelo matematico SEIR con aislamiento social. XX ENOAN, Universidad de San Nicolas de Hidalgo.

An G. May 2010. Dynamic knowledge representation of pulmonary inflammation. American Thoracic Society 2010 International Conference, New Orleans, LA.

An G. May 2010. Meta-engineering knowledge and utilization: A surgeon's perspective. Solving the Most Challenging Surgical Problems, University of Chicago, Chicago, IL.

An G. May 2010. The translational dilemma. Annual Project Meeting of the National Center for Biomedical Ontology, Palo Alto, CA.

Heard S, Godsoe W, Timmons S. May 2010. Exploitation of host plant morphospace by generalist and specialist phytophagous insects. Canadian Society for Ecology and Evolution (CSEE) 2010 Annual Meeting, Quebec, Canada.

Fister R, Buford G, Norris B, Lenhart S, Zhong P, Schaefer E, Gaff H. November 2010. Optimal control of cholera models. AMS Southeastern Section Meeting, Richmond, VA.

Gonzalez P. November 2010. Optimal control on a discrete time influenza model. NMSU/UTEP Workshop on Mathematics, Computer Science and Computational Sciences, University of Texas, El Paso, TX.

Krivan V. November 2010. On the Lotka-Volterra foraging games. University of Ilinois, Chicago, IL.

Potochnik A. November 2010. The limitations of hierarchical thinking. Dept of Philosophy Colloquium, Stanford University, Stanford, CA.

Bulger D, Geyer K, Trask J. 19-20 November 2010. Biodiversity in the Great Smoky Moutains National Park: Past and present measures. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Collins J, Thai N. 19-20 November 2010. Two ant species competition and climate change. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Keleman R. 19-20 November 2010. Modeling the effects of cymene on the distribution of germination and growth of Beauveria bassiana. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

An G. October 2010. Facilitating knowledge instantiation with agent-based modeling: Towards an ecological paradigm for biomedical research. Committee on Immunology Seminar Series, University of Chicago, Chicago, IL.

Velasco-Hernandez JX. October 2010. Sobre las enfrermedades infecciosas recurrentes: Patrones observados y modelacion. XII EOBM, UAEH.

An G. September 2010. Making science scale: Operational strategies for the future of biomedical research. Forum on the Future of Complex Systems Research and Application at the Complex Institute, University of North Carolina, Charlotte, NC.

An G. September 2010. Translational computational research: A future pathway for the academic surgeon. Grand Rounds, Dept of Surgery, University of Chicago, Chicago, IL.

Katz D, An G. September 2010. Dynamic knowledge representation of cellular redox homeostasis and oxidative stress response in a systems dynamics model   9th International Conference on Complexity in Acute Illness, Atlanta, GA.

Seal J, An G. September 2010. Agent-based model of instant blood-mediated inflammatory reaction (IBMIR) effects on immediate graft loss following intra-portal islet cell transplantation. 9th International Conference on Complexity in Acute Illness, Atlanta, GA.

Zamora Z, Villalobos C, Chowell G. September 2010. Optimal control of tuberculosis transmission. HESTEC Conference, Univeristy of Texas Pan-American, Edinburg, TX.

Zamora Z, Villalobos C, Chowell G. September 2010. Optimal control of tuberculosis transmission. University of Texas System NSF-LSAMP Conference, El Paso, TX.

Thibert-Plante X. 14 September 2010. Local adaptation and gene flow shaping biodiversity. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Gonzalez-Parra PA. 2011. Comparacion de estrategias para resolver un problema de control optimo en epidemiologia. 7 Congreso Latinoamericano.

Turner M, Lenhart S, Rosenthal B, Sullivan A, Zhao X. 2011. Modeling effective transmission strategies and control of the world's most successful parasite. Southeastern Atlantic Reional Conference on Differential Equations 2011.

Bewick SA, Chisholm RA, Akcay E, Godsoe W. 7-12 August 2011. 'Neutral' models with overlapping niches. The Ecological Society of America 2011 Annual Meeting, Austin, TX.

Hughes R. 7-12 August 2011. Population and community effects of marine plant genetic diversity. The Ecological Consequences of Intraspecific Variation, The Ecological Society of America Symposium on Theory and Dynamics of Savanna Systems, Austin, TX.

Platt WJ. 7-12 August 2011. Engineering of fire by savanna trees: Effects on overstory and groundcover dynamics. The Ecological Society of America Symposium on Theory and Dynamics of Savanna Systems, Austin, TX.

Bokil VA. December 2011. Stochastic models for competing species with a shared pathogen. In: Topics in Ecological Models, International Symposium on Biomathematics and Ecology: Education and Research, University of Portland, Portland, OR.

New J, Lee LE, Nguyen ATN, Lenhart SM, Robl N, Bugman AM, New JC, Lammers B, Jennings TL, Weimer H. 6 December 2011. Modeling feral cat population dynamics in Knox County, TN. Conference of Research Workers in Animal Disease, Chicago, IL.

Yahdi M. 9-11 December 2011. Parameter analysis and optimal control of a VRE model. International conference on Antibiotic-Resistant Infections: Mathematical Modeling, Transmission Dynamics and Control, University of Miami, FL.

Ingersoll T. February 2011. Zero-inflated count models for imperfectly observed invasions: Implications for white-nose syndrome surveillance. 21st Colloquium on the Conservation of Mammals in the Southeast United States, Louisville, KY.

Katz D, An G. February 2011. A systems dynamics approach to oxidative stress, p53 activity and their effects on cellular fate. 6th Academic Surgical Congress, Huntington Beach, CA.

Kim M, Christley S, Liu D, Alverdy J, and An G. February 2011. Feeding induced oxidative stress and the pathogenesis of necrotizing enterocolitis: Insights form an agent-based model. 6th Academic Surgical Congress, Huntington Beach, CA.

Stern JR, Zaborina O, Valuckaite V, Connolly J, Olivas AD, Alverdy JC, An G. February 2011. Bacterial virulence activation and impaired gut epithelial healing: Integration of an in vitro mechanisms with an agent-based model. 6th Academic Surgical Congress, Huntington Beach, CA.

Canner J. January 2011. How do we measure the response of species interactions to climate change? The use of models and experiments to study myrmecochory. MAA-AMS Joint Mathematics Meeting, New Orleans, LA.

Haynes KJ. January 2011. Spatiotemporal population dynamics of gypsy moths in North America. Departmental Seminar, Dept of Ecology & Evolutionary Biology, University of Toronto, Toronto, Ontario, Canada.

Kuang Y. January 2011. What we eat matters: Resource quality dynamics and its implications. Colloquium Talk, North Carolina State University, Raleigh, NC.

Hughes J, Cobbold C, Cooke B, Dwyer G, Haynes K, Pineda-Krch M. June 2011. The effect of landscape configuration on forest insect outbreak dynamics - insights from a simple host-parasitoid model. North American Forest Ecology Workshop, Roanoke, VA.

Thibert-Plante X, Gavrilets S. 17-21 June 2011. Evolution of mate choice, the trick behind the magic trait. Evolution 2011, Norman, Oklahoma.

An G. March 2011. Meta-engineering the generation and utilization of biomedical knowledge. Global Health Colloquium, Eck Institute for Global Health, Notre Dame University, South Bend, IN.

An G. March 2011. Translational systems biology of inflammation and healing. 10th Annual Scientific Retreat and Strategic Planning Mission of the McGowan Institute for Regenerative Medicine, Nemacolin Woodlands Resort, PA.

Christley S, An G. March 2011. Proposed agent-based composition of biomedical and simulation ontologies: Facilitating dynamic hypothesis instantiation. AMIA Summit on Translational Bioinformatics 2001, San Francisco, CA.

Yokomizo H. March 2011. Modeling the effects of habitat fragmentation and biotic resistance on biological invasions. Annual Meeting of the Ecological Society of Japan.

Godsoe W. May 2011. Does adaptation to early winter freezing contribute to insect outbreaks? Canadian Society for Ecology and Evolution (CSEE) 2011 Annual Meeting, Banff, Alberta, Canada.

Carter PA. November 2011. Evolution of the integrated phenotype: A function-valued approach. Seminar, Dept. of Biology, University of California, Riverside, CA.

Ryan SJ, Tildesley M. November 2011. Poster: The utility of land cover maps to inform spatial epidemic models of disease transmission in the UK livestock industry. EPIDEMICS3, 3rd International Conference on Infectious Disease Dynamics, Boston, MA.

Gaoue O. October 2011. Modeling the short- and long-term consequences of plant harvest. Invited Talk, Dept. of Mathematics, Howard Univ., Washington, DC.

Blankenship T, Yang Y. 21-22 October 2011. Statistical tracking of fast movements of organelles. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Botesteanu D, Goglio F, Yong Y. 21-22 October 2011. How does the effort a mother bird expends on her offspring depend on the attractiveness of her mate? Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Chitrakar R, Shrestha S. 21-22 October 2011. The effect of borneol on the germination and growth of the fungus Beauveria bassiana. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Lee L, Nguyen A. 21-22 October 2011. Modeling feral cat population dynamics in Knox County, TN. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Noecker C, Schaefer K, Zaccheo K. 21-22 October 2011. Modeling the first 7 days of HIV infection. Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

Bewick SA, Chisholm RA, Akcay E, Godsoe W. 27-30 October 2011. Tropical biodiversity: New models for an old problem. Mathematics at the 2011 Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference, San Jose, CA.

Yang Y. 28-29 October 2011. Statistical tracking of fast movements of organelles. Undergraduate Research Symposium at Washington Univ. in the Biological Sciences & Psychology, Midstates Consortium for Math & Science, St Louis, MO.

Bani-Yaghoub M, Gautam R, Shuai Z, van den Driessche P, Ivanek R. 7-9 October 2011. Basic and type-reproduction numbers for a compartmental model of an infectious disease with free-living pathogen. The Third International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems (ICMA III), San Antonio, TX.

Yahdi M, Dunlea M. September 2011. Optimal control theory for a VRE model. Annual Summer Research Symposium, Haverford College, PA.

Yokomizo H. September 2011. How do landscape heterogeneity and local community resistance interact to affect Cortaderia establishment and spread? Annual Meeting of the Japanese Society of Mathematical Biology.

Bishop, Pamela. 2012. Impacts of an interdisciplinary research center on participant publication and collaboration activities. American Evaluation Association Annual Conference 2012.

Gilman RT. 2012. Using models to predict evolution in changing environments. University of Manchester, Manchester, UK.

Kaiser KA, Dhurandhar EJ, Allison DB. 2012. Using empirical observations to update theoretical predictions of the effects of manipulations on components of energy balance. The Obesity Society Annual Meeting, San Antonio, TX.

Bewick S. April 2012. Too hot to handle: Temperature and its effects on the lives of ants. Invited Speaker, Dept of Biological Sciences, ETSU & the Institute for Quantitative Biology.

Gilot-Fromont E, Langlais M, Lelu M. April 2012. Prey abundance, fragmented spatial structure and T. gondii persistence. ReaDiLab, Universite du Paris-Sud, Orsay, France.

Oremland M. April 2012. Otpimization and control of agent-based models: Heuristics and beyond. Army Research Office Workshop: Biologically Inspired Algorithms for Multiobjective Optimization, Williamsburg, VA.

Turchin P, Storrs CT. November 2012. Historical database of sociocultural evolution: Design and coding.

Yahdi M. April 2012. Mathematical modeling, transmission dynamics and control of antibiotic-resistant infections. Invited Speaker, Mathematics and Statistics Colloquium, Villanova University.

Yahdi M, Dunlea M. April 2012. Modeling and analysis of a multiscale interaction. SIAM/MAA Third Mid-Atlantic Regional Applied Mathematics Conference, Shippensburg University.

Gross L. 6 April 2012. The vision of vision change. Invited Symposium Speaker, Association of Southeastern Biologists Annual Meeting, Athens, GA.

Magombedze G. 27-30 August 2012. Poster: Transmission and persistence of Johne's disease: Is the iceberg phenomenon consistent with disease transmission dynamics. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH.

Ngonghala C. 27-30 August 2012. The impact of insecticide impregnated bed-nets, indoor residual spraying, and treatment. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH.

Haynes KJ, Bjornstad ON, Allstadt AJ, Liebhold AM. 5-10 August 2012. Geographical variation in spatial synchrony of forest-insect outbreaks: Isolating the drivers of synchrony. The Ecological Society of America 2012 Annual Meeting, Portland, OR.

Kanarek A. 5-10 August 2012. Overcoming Allee effects through evolutionary, genetic, and demographic rescue. The Ecological Society of America 2012 Annual Meeting, Portland, OR.

Boone JD. December 2012. Adaptive management for free-ranging cats. The Outdoor Cat: Science and Policy from a Global Perspective, Humane Society of the United States, Marina Del Ray, CA.

Gilot-Fromont E, Langlais M, Lelu M. December 2012. A multi-stages and multi-hosts parasite / predator-prey system within a spatially fragmented environment. Gaston Berger University, Saint Louis, Senegal.

Gurarie D. December 2012. Random aggregation in SIR transmission: Agent approach. Optimal Control for Agent-based Models Working Group, NIMBioS, University of Tennessee, Knoxville, TN.

Iacona GD, Price FD, Armsworth PR. December 2012. Predicted invadedness of protected areas varies across species but is independent of funding. Ecological Society of Australia Conference, Melbourne, VIC.

Magombedze G. December 2012. Mycobacterium tuberculosis latency regulation: Insights from mathematical and computational modeling. John Hopkins University, Baltimore, MD.

Crosley E, Nivens A, Rubin I, Lanzas C, Lenhart S, Lelu M, Phan T. 2-4 December 2012. Poster: Modeling Salmonella dynamics within a finishing pig farm: Group structure effects on transmission. Conference of Research Workers in Animal Disease, Chicago, IL.

Lambrinos J. February 2012. Invasion risk in an edgy world. Ecology and Evolution Seminar Series, Oregan State University.

Magombedze G. February 2012. FME (R package) for sensitivity analysis in ODES. Math Biology Seminar, University of Tennessee, Knoxville, TN.

Momotani E. 3 February 2012. Epidemic situation and control of paratuberculosis in Japan. International Symposium on Worldwide Infectious Diseases of Farm Animal in Production Medicine: Prospective and Perspective.

Eda S, Lenhart S, Stabel J, Bannanitine J, Gardner I, Schukken Y. 5-10 February 2012. Investigative workshop for mathematical modeling of Johne's disease epidemiology. 11th International Colloquium on Paratuberculosis, Sydney, Australia.

Momotani E. 5-9 February 2012. Etiological relationship of Mycobacterium avium subsp. paratuberculosis and human Crohn's disease: Histological, molecular comparison and new evidence of the pathogenesis. Sydney, Australia.

Allen LJS. January 2012. Mathematical modeling of viral zoonoses in wildlife. Joint Mathematics Meetings, Special Session, Boston, MA.

Velasco-Hernandez JX. January 2012. Mathematical epidemiology: Examples, data and associated models. II Reunion Conjunta de la Real Sociedad Matematica Espanola y la Sociedad Matematica Mexicano.

Yahdi M, Dougherty E, Dunlea M, Watton C. January 2012. Poster: Optimal control theory for a VRE model. Annual Joint Mathematics Meetings of the MAA and AMS, Boston, MA.

Yahdi M, Dunlea M. January 2012. Optimal control for a VRE model. AMS Session on Mathematical Biology and Related Fields, American Mathematical Society (AMS), Boston, MA.

Botesteanu D. 4-7 January 2012. How does the effort a mother bird expends on her offspring depend on the attractiveness of her mate? Joint Mathematics Meeting, Boston, MA.

Botesteanu D. 6 January 2012. Poster: How does the effort a mother bird expends on her offspring depend on the attractiveness of her mate? Undergraduate Poster Session, Joint Mathematics Meeting, Boston, MA.

Lee L, Nguyen A. 6 January 2012. Poster: Modeling feral cat population dynamics in Knox County, TN. MAA Undergraduate Poster Session, Joint Mathematics Meeting, Boston, MA.

Bogen S, Robins J, Westhoek A. July 2012. Agent-based model for Johne's disease dynamics in a dairy herd. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Collier S, Lasebikan O, Liu Y. July 2012. Modeling the evolution of male sexual imprinting. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Crosley E, Nivens A, Rubin I. July 2012. Spatially explicit model of Salmonella transmission in grower pigs. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Dillon J, Li W, Perez A. July 2012. Modeling protein translation and genome evolution. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Dorazio RM. July 2012. Predicting the geographic distribution of a species from presence-only data subject to detection errors. Joint Statistical Meetings, San Diego, CA.

Griffin HC, Chaffee DW. July 2012. The evolution of sexual imprinting. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Hall F, Welch J, Woodard D. July 2012. The effects of constituent monoterpenes of Monarda on sporulation and germ tube growth of Beauveria bassiana. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Hennessey K, Mutambuka V, Rhoads A. July 2012. Estimating rates of HIV recombination during first months post infection. UT STEM REU Symposium, University of Tennessee, Knoxville, TN.

Lelu M, Langlais M, Poulle ML, Gilot-Fromont E, Gandon S. July 2012. Poster: When should a trophically and vertically transmitted parasite manipulate its intermediate host? First Joint Congress on Evolutionary Biology, Otawa, Canada.

Oremland M. July 2012. Model reduction and model conversion. SwarmFest, Charlotte, NC.

Welsh C. July 2012. Fostering interdisciplinarity at the interface of biology and mathematics: Lessons from a national institute. International Union of Biological Sciences 2012 Conference, Suzhou, China.

Bewick S, Shik J, Stuble K, Karsai I. 25-28 July 2012. Thermoregulation by cavity nesting ants. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Bogen S, Robins J, Westhoek A. 25-28 July 2012. Poster: Agent-based model for Johne's disease dynamics in a dairy herd. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Bokil VA. 25-28 July 2012. Stochastic models for competing species with a shared pathogen. In Minisymposium: Epidemiology of Multi-host Pathogens: Math and Biology Perspectives, Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Collier S, Khan F, Lasebikan O, Finotti H, Gilman T, Kozak G. 25-28 July 2012. Modeling the evolution of sexual imprinting. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Collier S, Lasebikan O, Liu Y, Finotti H, Kozak G, Gilman T. 25-28 July 2012. Poster: Modeling the evolution of male sexual imprinting. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Crosley E, Nivens A, Rubin I. 25-28 July 2012. Poster: Spatially explicit model of Salmonella transmission in grower pigs. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Dillon J, Li W, Perez A. 25-28 July 2012. Poster: Modeling protein translation and genome evolution. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Griffin HC, Chaffee DW. 25-28 July 2012. Poster: The evolution of sexual imprinting. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Hall F, Welch J, Woodard D. 25-28 July 2012. Poster: The effects of constituent monoterpenes of Monarda on sporulation and germ tube growth of Beauveria bassiana. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Hennessey K, Mutambuka V, Rhoads A. 25-28 July 2012. Poster: Estimating rates of HIV recombination during first months post infection. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Kanarek A. 25-28 July 2012. Individual-based modeling and the consequences of Allee effects. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Lelu M, Langlais M, Poulle ML, Gilot-Fromont E, Gandon S. 25-28 July 2012. When should a trophically and vertically transmitted parasite manipulate its intermediate host? Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Magombedze G. 25-28 July 2012. Assessment of Th1/Th2 immune response paradigm in Mycobacterium avium subspecies paratuberculosis infections. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Massaro T, Lenhart S, Eda S. 25-28 July 2012. Mathematical modeling for cost analysis of EVELISA-based Johne's disease control. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Ngonghala C. 25-28 July 2012. Mosquito demography and nourishment habits can account for observed patterns in malaria transmission. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Oremland M. 25-28 July 2012. Discrete model conversion and heuristic control for a spatially explicit resource-based ABM. Society of Mathematical Biology (SMB) 2012 Annual Meeting, Knoxville, TN.

Thibert-Plante X, Berner D. 6-10 July 2012. The evolution of habitat preference in ecological speciation. Evolution 2012, Ottawa, Ontario, Canada.

Gross L. 13-15 June 2012. Creating a collaborative and mentoring community. Panel Leader, HHMI Making Biomath Happen Meeting, University of Arizona, Tucson, AZ.

Gross L. 18-19 June 2012. An introduction to thinking like a probabilist about biology. MBI/NIMBioS/CAMBAM Summer Graduate Workshop, Ohio State University.

Gross L. 28-30 June 2012. Examples of quantitative activities for introductory biology. AAAS/NSF Workshop on Introductory Biology.

Gross L. 28-30 June 2012. Quantitative aspects of introductory biology. Workshop Session, AAAS/NSF Workshop on Introductory Biology.

Carter PA. March 2012. Evolution of biological shape: A function-valued approach. Plenary talk, The Histochemical Society and NSF Innovations in Biological Imaging and Visualization Pis Meeting, Marine Biological Laboratory, Woods Hole, MA.

Carter PA. March 2012. Poster: Analysis of mass growth curve of flour beetles. The Histochemical Society and NSF Innovations in Biological Imaging and Visualization Pis Meeting, Marine Biological Laboratory, Woods Hole, MA.

Kanarek A. 20 March 2012. Paradox lost: Rescure from Allee effects. Applied Biomathematics, SUNY Stony Brook.

Gross L. 27-30 March 2012. Mathematics and Life Science Education: Promoting Interdisciplinarity. St. Olaf College, Northfield, MN.

Gross L. 27-30 March 2012. Space and control in natural systems. St. Olaf College, Northfield, MN.

Schaefer K. 29-30 March 2012. Modeling the first 7 days of HIV infection. National Conference of Undergraduate Researchers, Ogden, UT.

Gilot-Fromont E, Langlais M, Lelu M. May 2012. A multi-stages and multi-hosts parasite / predator-prey system within a spatially fragmented environment. Bio-Dynamics Day 2012 Workshop, Universite du Havre, Le Havre, France.

Ryan SJ, Tildesley M. May 2012. Poster: Disease prevention or data privacy: Are landcover maps useful in informing spatial epidemic models? 2012 EEID Conference, Univ. of Michigan, Ann Arbor, MI.

Gross L. 1 November 2012. Model evaluation and data needs: One biologist's perspective. NRC Workshop on Data Collection in Support of Modeling and Simulation, Washington, DC.

Kanarek A. 11-14 November 2012. Modeling quantitative genetics: How to be genetically explicit. Insect Plant Interaction Symposium, Entomological Society of America National Meeting.

Gilman RT. 16 November 2012. Using models to predict evolution in changing environments. Invited Seminar, Centre for Mathematical Biology, University of Bath.

Gilman RT. 22 November 2012. Using models to predict evolution in changing environments. Animal and Plant Sciences Seminar, University of Sheffield.

Gilman RT. 6 November 2012. Using models to predict evolution in response to environmental change. EBC Graduate School Seminar, Uppsala University.

Boone JD. October 2012. A vision for more effective management of free-ranging cats. ACC&D Stakeholders Meetings, Las Vegas, NV.

Magombedze G. October 2012. Mycobacterium tuberculosis regulatory mechanisms in latency infection. University of Minnesota, Minneapolis, MN.

Martinez M. October 2012. Optimal control of integrodifference equations in a host-pathogen system. South-Atlantic Regional Conference on Differential Equations (SEARCDE), Winston Salem, NC.

Miller P. October 2012. Free-roaming cat population dynamics: A simulation modeling project update Alliance for Contraception in Cats and Dogs, Stakeholder Meeting, Las Vegas, NV.

Ngonghala C. October 2012. Epidemiology meets ecology: How understanding insects helps fight disease. Scientific Symposium, SACNAS Conference, Seattle, WA.

Ngonghala C. October 2012. The role of stochasticity and safety nets in breaking disease-induced poverty traps. Modern Mathematics Workshop, SACNAS Conference, Seattle, WA.

Ngonghala C. October 2012. Understanding mosquito demography can improve malaria control: New mathematical modeling insights. Computational and Applied Mathematics Seminar, Purdue University.

Oremland M. October 2012. Mathematical analysis of agent-based models: Discrete and heuristic methods SACNAS National Conference, Seattle, WA.

Gross L. 22-23 October 2012. NIMBioS: Examples of research efforts at the interface of mathematics and the life sciences involving multiple scales. NIH/NIBIB Multiscale Modeling Consortium Poster Session, Bethesda, MD.

Gilman RT. 26 October 2012. Using models to predict evolution in response to environmental change. Centre for Ecological and Evolutionary Synthesis Seminar, University of Oslo.

Gurarie D. September 2012. Disease transmission in complex environment: How mathematics could help to predict and control infections. Colloquium, Medical School and Institute of Natural Sciences, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil.

Gurarie D. September 2012. Heterogeneity in helminth infection, transmission and control. Invited address, 13th International Symposium on Schistosomiasis, Belo Horizonte, MG, Brazil.

Magombedze G. September 2012. Understanding Mycobacterium tuberculosis latency infection Emory University, Atlanta, GA.

Magombedze G. September 2012. Understanding the underlying mechanisms of persistence in mycobacterial infections. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Burghardt GM. 10 September 2012. Origins and biology of play. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany.

Kanarek A. 12-14 September 2012. Allee effects and invasion success. NEOBIOTA, Halting Biological Invasions: From Data to Decisions, 7th European Conference on Biological Invasions, Pontevedra, Spain.

Burghardt GM. 13 September 2012. Signposts of progress in understanding the mystery of play: A bottom up approach. Play, Ritual and Believe in Animals and In Early Human Societies, McDonald Institute for Archaeological Research, Cambridge University, UK.

Burghardt GM. 14 September 2012. The origins, evolution, and interconnections of play and ritual: Setting the stage. Play, Ritual and Believe in Animals and In Early Human Societies, McDonald Institute for Archaeological Research, Cambridge University, UK.

Burghardt GM. 17 September 2012. The origins and biology of animal play. Zoology Department, Oxford University, UK.

Martin RA. 2013. Ecological causes of selection and divergence. Dept. of Biology, Case Western Reserve University.

Martin RA, Langerhans RB. 2013. Piscivorous fish in a fishless environment: Dietary and phenotypic differentiation of bigmouth sleepers in Bahamas blue holes. Society for Integrative and Comparative Biology.

Remien CH. 2013. You are more than what you eat. Ideas of March Conference, Salt Lake City, UT.

Earl JE. April 2013. Poster: Effects of animal movement ecology on the spatial distribution of active subsidies. Systems Ecology Symposium, University of Georgia's Odum School of Ecology.

Currie T. 16 April 2013. War and space: Simulating the evolution of old world complex societies. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Gross L. 16-17 April 2013. "Best" in a biological context: Optimization across the biological hierarchy. Murray State University, Murray, KY.

Gross L. 16-17 April 2013. Educational approaches to encourage "fearless" scientists: Some lessons from 30 years of initiatives at the math/biology interface. Murray State University, Murray, KY.

Remien CH. 18 April 2013. Mathematical modeling of liver injury from acetaminophen overdose. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Ilany A. 2 April 2013. Social networks in the hyrax and the hyena: From static t o dynamic. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Spencer M. 24 April 2013. Measuring the rate of succession. Invited Seminar, University of Sheffield, UK.

Magombedze G. 29 April 2013. Mathematical modeling of host-pathogen immunological interactions and molecular biological systems. Math Colloquium, West Virginia University, Morgan Town, WV.

Noon K, Welsh CJE, Ingersoll T. 30 April 2013. Analysis of changes in wintering bird numbers using the Knoxville Christmas Bird Count as a case study. Science Academy STEM A-ffair, Farragut High School, Farragut, TN.

Gross L. 5 April 2013. Mathematics and Life Science Education: Promoting Interdisciplinarity. University of Florida, Gainesville, FL.

Sattenspiel L, Swedlund A. 9 April 2013. Modeling the demography of a pre-Columbian Southwest U.S. population: The Artificial Long House Valley (ALHV) project. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Burghardt GM. 5 August 2013. The origins of playfulness. International Ethological Conference, Newcastlegateshead, UK.

Ilany A. February 2013. Modeling animal social networks. Bioinformatics Colloquium, University of Texas, El Paso, TX.

Magombedze G. February 2013. How to develop immunological models for infectious diseases. Guest Lecture, Howard University, DC.

Magombedze G. February 2013. Transmission and persistence of Johne's Disease. Mathematics Colloquia & Seminar, Howard University, DC.

Gurarie D. 12 February 2013. Agent-based approach to malaria. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Burghardt GM. 19 February 2013. The play factor in religious rituals: Evidence from an unexpected source. Conference on the Value of Play, U.S. Play Coalition, Clemson University, SC.

Gross L. 19 February 2013. "Best" in a biological context: Optimization across the biological hierarchy. Morehouse College, Atlanta, GA.

Yong K. 21 February 2013. Estimating biting rates of triatomine on preferred sylvatic hosts in overlapping vector-host cycles. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Jiang J. 25 February 2013. Understanding ecological processes of species-environment interactions. Invited talk, South Florida Water Management District, West Palm Beach, FL.

Berec L. 26 February 2013. Allee effects and pest control. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Noon K, Welsh CJE, Ingersoll T. 28 February – 1 March 2013. Analysis of changes in wintering bird numbers using the Knoxville Christmas Bird Count as a case study. 48th Annual Tennessee Junior Science and Humanities Symposium, UT Conference Center, Knoxville, TN.

Gilman RT. 7 February 2013. The evolution of sexual imprinting. FroSpects Workshop on Behavior and Speciation, University of Oslo.

Berg CL, Chow JS, Mcgee MD, Wainwright PC. January 2013. Divergent feeding kinematics in two Amazonian cichlids. Annual Meeting of the Society of Integrative and Comparative Biology, San Francisco, CA.

Borstein SR, Mcgee MD, Wainwright PC. January 2013. Mouthbrooding does not constrain craniofacial diversity in Lake Tanganyika cichlids. Annual Meeting of the Society of Integrative and Comparative Biology, San Francisco, CA.

Chow JS, Berg CL, Hymes M, Mcgee MD, Wainwright PC. January 2013. Convergent feeding kinematics in elongate cichlids. Annual Meeting of the Society of Integrative and Comparative Biology, San Francisco, CA.

Collar DC, Mehta RS, Holzman R, Wainwright PC. January 2013. The morphological and kinematic basis of suction feeding performance evolution. Annual Meeting of the Society of Integrative and Comparative Biology, San Francisco, CA.

Haynes KJ. January 2013. Geographical variation in spatial synchrony of gypsy moth outbreaks: Isolating effects of weather and dispersal. USDA Interagency Research Forum on Invasive Species.

Lawing AM. January 2013. Using the past to inform future expectations of species response to climate change. The Convergence of Conservation Paleontology and Biogeography Plenary Symposium, 6th International Biogeography Conference, Miami, FL.

Martinez M. January 2013. Optimal control of integrodifference equations in a host-pathogen system. Speaker, Joint Mathematics Meetings, San Diego, CA.

Ngonghala C. January 2013. Poverty traps driven by feedback between economics and the ecology of infectious diseases. Master of Public Health Lecture, Ecole des Hautes Etudes en Sant'e Publique (EHESP), Paris, France.

Diekmann O. 15 January 2013. How to compute R_0? (The general idea and a complicated example). NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Blumstein D. 17 January 2013. The sound of fear: A journey from marmot meadows to Hollywood. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Gilman RT, Behm JE. 17 January 2013. Hybridization, species collapse, and reemergence after habitat disturbance. FroSpects Workshop on Species Interactions and Speciation, Umea University.

Muller-Landau H. 29 January 2013. Species coexistence and spatial patterns in plant communities. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Smuts B. 28 July – 1 August 2013. Keynote Address: Social behavior in wolves and dogs. 50th Annual Meeting of the Animal Behavior Society, Boulder, CO.

Remien CH, Sussman NL, Adler FR. 10-13 June 2013. Mathematical modeling acetaminophen metabolism and liver injury. Society of Mathematical Biology (SMB) 2013 Annual Meeting, Tempe, AZ.

Gross L. 12-14 June 2013. Putting it all together: An integrated view of the life science curriculum. Keynote, HHMI Quantitative Biology Workshop, Emory University, Atlanta, GA.

Allman E. March 2013. Inferring species trees from gene trees: Combinatorial approaches. Computational Biology Seminar, University of California, Berkeley.

Gross L. 13-15 March 2013. Space and control in natural systems. SEMOVI Series, Universite de Lyon, Lyon, France.

Magombedze G. 18-22 March 2013. Poster: Latency and dormancy gene regulatory mechanisms in Mycobacterium tuberculosis latency infection. Keyston Symposium: Host Response in Tuberculosis, Whistler, British Columbia, Canada.

Cordoni G. 18-22 March 2013. Let you play your cards right! Play behaviour and the maintenance of peaceful social relationships in primatesObstacles and Catalysis of Peaceful Behavior, Lorentz Centre, Leiden, The Netherlands.

Palagi E. 18-22 March 2013. Natural conflict resolution: Retrospect and prospect. Plenary talk, Lorentz Center, University of Leiden, The Netherlands.

Martin R. 19 March 2013. Ecological causes of phenotypic selection and divergence. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Gross L. 4 March 2013. Savannas, invasions and lessons from some mathematical models. Mathematical Biosciences Institute, Ohio State University, Columbus, OH.

Lawing M. 5 March 2013. Species geographic response to past climate change and the evolution of multivariate systems. NIMBioS Seminar Series, NIMBioS, University of Tennessee, Knoxville, TN.

Eda S. May 2013. Mathematical modeling of Johne's disease epidemiology and immunology. Invited Seminar, Universidad Autonoma de Baja California, Mexicali, Mexica.

Chen S, Sanderson M, White B, Amrine D, Lanzas C. 20-23 May. Poster: Temporal-spatial heterogeneity in animal-environment contact: Implications for the exposure and transmission of pathogens. Ecology and Evolution of Infectious Disease, State College, PA.

Gross L. 28 May 2013. Space and control in natural systems. National Science Foundation, Biological Sciences Directorate.

GRANTS/PROPOSALS

Bokil VA, Allen L. 2010. Stochastic patch models for the spread of disease in heterogeneous landscapes. NSF-AWM Mentoring Travel Award. $3,315. Accepted.

Baroch J, Dubey JP, Rosenthal B. 2011. Proposal: Transmission dynamics of Trichinella and Toxoplasma between domestic and feral swine. National Wildlife Disease Program, USDA APHIS. $10,000. Accepted.

Karsai I. 2011. Proposal: The effects of climate change on ant colony dynamics. RDC 12-005M ETSU. $10,000. Accepted.

Riley S, Riley P, Bacon D. 2011. Proposal: Near real-time forecasting of influenza dynamics. NCMI. $700,000. Accepted.

Platt WJ. 2011-2013. REU Supplement to "Collaborative Research: Linking models to data to investigate patterns and process in savannas." National Science Foundation. $15000. Accepted.

Webb C. 2011-2013. Developing network models - cattle movements (more CVI data entry). USDA. $110,298. Accepted.

Webb C. 2011-2013. Farm location and animal population simulator (FLAPS). USDA. $288,064. Accepted.

Webb C. 2011-2013. Local Cattle Movement: Michigan. USDA. $236,589. Accepted.

Hoeksema JD, Booth MG. 2011-2014. Collaborative Research: Price determination in ectomycorrhizal symbioses. National Science Foundation. $420,000. Accepted.

Lambrinos J. 2012. Grant to visit Yokomizo in Japan. International Programs Faculty Grant. Oregon State University. $2,000. Accepted.

Liu L, Liberles DA. 2012. Developing a probabilistic model for gene family evolution. National Science Foundation. $300,000. Accepted.

Miller P. 2012. Development of outdoor cat population model. ASPCA. $50,000. Accepted.

Perry S. 2012. Coalitions and alliances in wild capuchin monkeys. National Geographic Society. $22,000. Accepted.

Perry S. 2012. Coalitions and alliances in wild capuchins. Leakey Foundation, Lomas Barbudal, Costa Rica. $22,000. Accepted.

Slater S, Zawistowski S, Boone J, Miller P, Levy J, Lawler D. 2012. Alliance for Contraception in Cats and Dogs. Evaluating management alternatives for free-roaming cat populations across a range of landscapes: An individual-based, demographic simulation modeling approach. ASPCA. $45,000. Accepted.

Stiver WH. 2012. Determining movements of wild hogs for disease modeling and control efforts in the Big South Fork National River and Recreation Area and the Great Smoky Mountains National Park. National Park Service. $335,600. Accepted.

Stiver WH. 2012. Proposal: Continue Intensive Wild Hog Control and Disease Monitoring in the Southwestern Portion of Great Smoky Mountains National Park. Tallassee Fund. $21,000. Accepted.

Xiao Y. 2012. Functional organization of color selective neurons in primate visual cortex. NIH. $1,695,000. Accepted.

Kaiser KA, Dhurandhar EJ. 2012-2013. Empirically informed predictions of human adult body weight change in response to energetic perturbations. International Life Sciences Institute, North America. $129,789. Accepted.

Webb C. 2012-2013. Additional CVI data collection - annual variation. USDA. $181,227. Accepted.

Webb C. 2012-2013. CVI analysis: Production type and seasonality. USDA. $82,331. Accepted.

Swat M, Glazier J, Sauro H, Stern C, Grabe N, Merks, R, Jacinto A. 2012-2014. QuantTissue.eu. 20,000 Euros per year for three years. Accepted.

Sonderegger D. 2013. Synthesizing global viral abundance. Northern Arizona University. $7,500. Accepted.

MEDIA COVERAGE

Vulinec K. Bats in trouble? Fungus may destroy population. *Delaware State News*. 2010.

Pannkuk EL. Massive bat kill-offs in the northeast United States caused by a fungus: Is Arkansas next? *The Jonesboro Sun.* January 2010.

Welsh J. Wail, chuck, snort: Rock hyraxes sing complex songs. *LiveScience.* April 17, 2012.

Sloan A. Noon sharpens data collection. *Farragut Press*. January 10, 2013.

Amos A. Bird watchers hope to get trend data published. *Knoxville News Sentinel.* January 29, 2013.

Middle school girls take an Adventure in STEM at CURENT. *CURENT Online.* June 10, 2013.

FEATURED ARTICLES (by Catherine Crawley, NIMBioS' Communication Coordinator)

Biological fitness trumps other traits in mating game. June 19, 2013.

Listening for the building blocks of language in the sounds of the sea. June 17, 2013.

Hyena behavior unlocks science behind social networks. June 17, 2013.

Predicting shorelines of the future from storm surge affects. June 17, 2013.

Mathematics connects hidden processes to biological measurements. June 17, 2013.

Reconstructing the past: New models in the tree of life. June 17, 2013.

Questioning cooperation in a selfish world. June 17, 2013.

How will species adapt to a warmer planet? June 17, 2013.

Agents of selection: Scientist synthesizes the myriad causes. June 17, 2013.

Ecologist strives to improve human-animal co-habitation. May 3, 2013.

Can the friend of my friend be my enemy? Choice affects stability of the social network. April 22, 2013.

Net advantage: Study finds use of bed nets by 75 percent of population could eradicate malaria. March 7, 2013.

U.S. Supreme Court under the microscope: Biodiversity statistics reveal mixed results in Court makeup. February 11, 2013.

Avoiding a cartography catastrophe: Study recommends new tools to improve global mapping of infectious disease. February 4, 2013.

Study finds epigenetics, not genetics, underlies homosexuality. December 11, 2012.

NIMBioS songwriter spins science tunes on new EP. November 13, 2012.

Privacy vs. protection: Study considers how to manage epidemics in information blackouts. November 1, 2012.

MEETING/WORKSHOP/SYMPOSIUM

Jerde C, Daszak P, Finnoff D, Smith K, Chadderton WL, Lodge D. 2009. Uncertainty in net present value emerging from punctuate rare event damages: Emerging infectious diseases and biological invasions. Organized session.

Ceddia MG. June 2010. Anaging epidemics in metapopulations: Do non-convexities matter for policy? Organized session at the 4th World Congress of Environmental and Resource Economists, Montreal, CA.

Fenichel F, Castillo-Chavez C, Ceddia M, Chowell G, Gonzalez-Parra P, Hickling G, Holloway G, Horan R, Morin B, Perrings C, Springborn M, Velazquez L, Villalobos C. June 2010. Epidemiological models with human economic behavior. Organized Session: 4th World Congress for Environmental and Resource Economics, Montreal, Canada.

Morin B, Fenichel E, Castillo-Chavez C. June 2010. A brief look at economic structure in epidemiology. Organized session at the 4th World Congress of Environmental and Resource Economists, Montreal, CA.

Schwab C. November 2010. Connecting the threads: Network theory for living systems. Focal Symposium, Konrad Lorenz Institute for Evolution and Cognition Research (KLI), and the Dept. of Theoretical Biology, University of Vienna, Vienna, Austria.

Swat M, Glazier J, Sauro H, Heiland R. August 2011. Developing biomedical simulations using CompuCell3D and SBW, Indiana University, Bloomington, IN.

Ellis-Monaghan J, Pangborn G. 15-16 July 2011. Discrete Mathematics Day Conference, Saint Michael's College, Colchester, VT.

Beder J, Carter PA, Gervini D, Houle D, Joshi S, Marron J, Mio W, Kingsolver J, Heckman N. May 2011. Program in analysis of object data, Statistical and Applied Mathematical Sciences Institute (SAMSI), Durham, NC.

Rao R, Kaplan E, Xiao Y, Neimark-Geffen M. November 2011. Measurement and analysis of cortical networks. Satellite meeting of the Society of Neuroscience Annual Meeting, Washington, DC.

Cortez R, Lenhart S, Ratsch C, Rubio I. 26-27 October 2011. Ecology & Evolution Events, Society for Advancement of Chicanos and Native Americans in Science's (SACNAS) 2011 Annual Conference San Jose, CA.

Cortez R, Lenhart S, Ratsch C, Rubio I. 26-27 October 2011. NSF Mathematics Institutes' Modern Math Workshop, Society for Advancement of Chicanos and Native Americans in Science's (SACNAS) 2011 Annual Conference, San Jose, CA.

23-24 February 2012. Coordinators of Education and Outreach and Communication (CEOC) Meeting, NIMBioS, Knoxville, TN.

Turchin P, Fortunato L, Gavrilets S. 2012 February 6-8. Modeling Social Complexity. NIMBioS-NESCent Investigative Workshop, NIMBioS, University of Tennessee, Knoxville, TN.

Ganusov V, Kleinstein S, Ribeiro RM, Perelson AS. January 2012. Second International Workshop: Systems Approaches in Immunology, Santa Fe, NM.

4-7 January 2012. Joint Mathematics Meeting open house, co-sponsored by NSF Mathematics Institutes, & education session co-sponsored by Society for Industrial and Applied Mathematics, Boston, MA.

Allen E, Allen L, Anderson D, Gross L, Krone S, Lanchier N, McKinley S, Pearl D, Schreiber S. 18-29 June 2012. Joint 2012 MBI-NIMBioS-CAMBAM Summer Graduate Workshop on Stochastics Applied to Biological Systems, Mathematical Biosciences Institute, Ohio State University, Columbus, OH.

Cortez R, Lenhart S, Ratsch C, Rubio I. 10-11 October 2012. NSF Mathematics Institutes' Modern Math Workshop, Society for Advancement of Chicanos and Native Americans in Science's (SACNAS) 2012 Annual Conference, San Jose, CA.

Cortez R, Lenhart S, Ratsch C, Rubio I. 10-14 October 2012. Ecology & Evolution Events, Society for Advancement of Chicanos and Native Americans in Science's (SACNAS) 2012 Annual Conference San Jose, CA.

Verbeeck P, Fry D. 18-22 March 2013. Obstacles and Catalysts of Peaceful Behavior. Lorentz Center, University of Leiden, The Netherlands.

This supporting file has been included because RESEARCH.GOV allows only 127 products to be entered directly. This file contains a full listing of the 240 products reported to NIMBioS since our last Annual Report, which was submitted May 1, 2012. Some of these products appeared prior to September 1, 2012 but are included herein because they have not appeared in any previous NIMBioS Annual Report. All of these were products that would have been entered directly in RESEARCH.GOV except for the 127 product limit. Additional products (presentations, grants/proposals, media coverage, featured articles, and meetings/workshops/symposia) that would not have been entered directly have been included in Section Y5-5 of the Addendum.

Products

Journals

- Federico, Paula; Gross, Louis J.; Lenhart, Suzanne; Ryan, Dan (1/1/13). Optimal Control in Individual-Based Models: Implications from Aggregated Methods. *AMERICAN NATURALIST*. 181 (1), 64-77.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Sullivan, Adam; Agusto, Folashade; Bewick, Sharon; Su, Chunlei; Lenhart, Suzanne; Zhao, Xiaopeng (7/1/12). A MATHEMATICAL MODEL FOR WITHIN-HOST TOXOPLASMA GONDII INVASION DYNAMICS. *MATHEMATICAL BIOSCIENCES AND ENGINEERING*. 9 (3), 647-662.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Zhong, Peng; Lenhart, Suzanne (9/1/12). OPTIMAL CONTROL OF INTEGRODIFFERENCE EQUATIONS WITH GROWTH-HARVESTING-DISPERSAL ORDER. *DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS-SERIES B*. 17 (6), 2281-2298.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Agusto, Folashade B.; Marcus, Nizar; Okosun, Kazeem O. (5/22/12). APPLICATION OF OPTIMAL CONTROL TO THE EPIDEMIOLOGY OF MALARIA. *ELECTRONIC JOURNAL OF DIFFERENTIAL EQUATIONS*. .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Agusto, F. B.; Ogunye, O. R. (4/1/10). AVIAN INFLUENZA OPTIMAL SEASONAL VACCINATION STRATEGY. *ANZIAM JOURNAL*. 51 (4), 394-405.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Agusto, Folashade B.; Bewick, Sharon; Parshad, Rana D. (9/1/12). Mosquito management in the face of natural selection. *MATHEMATICAL BIOSCIENCES*. 239 (1), 154-168.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Agusto, Folashade B.; Del Valle, Sara Y.; Blayneh, Kbenesh W.; Ngonghala, Calistus N.; Goncalves, Maria J.; Li, Nianpeng; Zhao, Ruijun; Gong, Hongfei (3/7/13). The impact of bed-net use on malaria prevalence. *JOURNAL OF THEORETICAL BIOLOGY*. 320 58-65.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Agusto, F. B.; Okosun, K. O. (9/1/10). OPTIMAL SEASONAL BIOCONTROL FOR EICHHORNIA CRASSIPES. *INTERNATIONAL JOURNAL OF BIOMATHEMATICS*. 3 (3), 383-397.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Allen, Linda J. S.; Bokil, Vrushali A. (7/1/12). STOCHASTIC MODELS FOR COMPETING SPECIES WITH A SHARED PATHOGEN. *MATHEMATICAL BIOSCIENCES AND ENGINEERING*. 9 (3), 461-485.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Allman, Elizabeth S.; Degnan, James H.; Rhodes, John A. (1/1/13). Species Tree Inference by the STAR Method and Its Generalizations. *JOURNAL OF COMPUTATIONAL BIOLOGY*. 20 (1), 50-61.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- An, Gary; (7/21/10). Closing the Scientific Loop: Bridging Correlation and Causality in the Petaflop Age. *SCIENCE TRANSLATIONAL MEDICINE*. 2 (41), .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- An, Gary C.; (1/1/10). Translational systems biology using an agent-based approach for dynamic knowledge representation: An evolutionary paradigm for biomedical research. *WOUND REPAIR AND REGENERATION*. 18 (1), 8-12.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Araujo, Marcio S.; Bolnick, Daniel I.; Layman, Craig A. (9/1/11). The ecological causes of individual specialisation. *ECOLOGY LETTERS*. 14 (9), 948-958.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Araujo, M. S.; Bolnick, D. I.; Martinelli, L. A.; Giaretta, A. A.; dos Reis, S. F. (7/1/09). Individual-level diet variation in four species of Brazilian frogs. *JOURNAL OF ANIMAL ECOLOGY*. 78 (4), 848-856.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- DeAngelis D (5/1/13). The case for ratio dependence in trophic ecology. *Trends in Ecology & Evolution*. 28 (5), 259–260.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; DOI: 10.1016/j.tree.2012.12.002

- Gavrilets, Sergey; Duenez-Guzman, Edgar A.; Vose, Michael D. (10/1/08). Dynamics of Alliance Formation and the Egalitarian Revolution. *PLOS ONE*. 3 (10), .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Handa, Naofumi; Ichige, Asao; Kobayashi, Ichizo (7/1/09). Contribution of RecFOR machinery of homologous recombination to cell survival after loss of a restriction-modification gene complex. *MICROBIOLOGY-SGM*. 155 2320-2332.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Carrillo-Valenzo, Erik; Danis-Lozano, Rogelio; Velasco-Hernandez, Jorge X.; Sanchez-Burgos, Gilma; Alpuche, Celia; Lopez, Irma; Rosales, Claudia; Baronti, Cecile; de Lamballerie, Xavier; Holmes, Edward C.; Ramos-Castaneda, Jose (9/1/10). Evolution of dengue virus in Mexico is characterized by frequent lineage replacement. *ARCHIVES OF VIROLOGY*. 155 (9), 1401-1412.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- D'Onofrio, David J.; An, Gary (1/21/10). A comparative approach for the investigation of biological information processing: An examination of the structure and function of computer hard drives and DNA. *THEORETICAL BIOLOGY AND MEDICAL MODELLING*. 7 .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Gavrilets, Sergey; (6/1/10). Rapid Transition towards the Division of Labor via Evolution of Developmental Plasticity. *PLOS COMPUTATIONAL BIOLOGY*. 6 (6), .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Hamer, Sarah A.; Tsao, Jean I.; Walker, Edward D.; Hickling, Graham J. (3/1/10). Invasion of the Lyme Disease Vector Ixodes scapularis: Implications for Borrelia burgdorferi Endemicity. *ECOHEALTH*. 7 (1), 47-63.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Harp, John R.; Gilchrist, Michael A.; Onami, Thandi M. (11/15/10). Memory T Cells Are Enriched in Lymph Nodes of Selectin-Ligand-Deficient Mice. *JOURNAL OF IMMUNOLOGY*. 185 (10), 5751-5761.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Mi, Qi; Li, Nicole Yee-Key; Ziraldo, Cordelia; Ghuma, Ali; Mikheev, Maxim; Squires, Robert; Okonkwo, David O.; Verdolini-Abbott, Katherine; Constantine, Gregory; An, Gary; Vodovotz, Yoram (9/1/10). Translational systems biology of inflammation: potential applications to personalized medicine. *PERSONALIZED MEDICINE*. 7 (5), 549-559.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Ozpolat, B. Duygu; Akcay, AkcayErol; Somel, Nazli; Somel, Mehmet (8/1/10). Bringing the understanding of evolution to Turkish public: A volunteer organization model for developing countries. *DEVELOPMENTAL BIOLOGY*. 344 (1), 439-439.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Rice, William R.; Gavrilets, Sergey; Friberg, Urban (9/7/10). The evolution of sex-specific grandparental harm. *PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES*. 277 (1694), 2727-2735.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Shah, Premal; Gilchrist, Michael A. (7/2/10). Is Thermosensing Property of RNA Thermometers Unique?. *PLOS ONE*. 5 (7), .
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Vodovotz, Yoram; Constantine, Gregory; Faeder, James; Mi, Qi; Rubin, Jonathan; Bartels, John; Sarkar, Joydeep; Squires, Robert H., Jr.; Okonkwo, David O.; Gerlach, Joerg; Zamora, Ruben; Luckhart, Shirley; Ermentrout, Bard; An, Gary (6/1/10). Translational Systems Approaches to the Biology of Inflammation and Healing. *IMMUNOPHARMACOLOGY AND IMMUNOTOXICOLOGY*. 32 (2), 181-195.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

- Carmona-Fontaine, Carlos; Theveneau, Eric; Tzekou, Apostolia; Tada, Masazumi; Woods, Mae; Page, Karen M.; Parsons, Maddy; Lambris, John D.; Mayor, Roberto (12/13/11). Complement Fragment C3a Controls Mutual Cell Attraction during Collective Cell Migration. *DEVELOPMENTAL CELL*. 21 (6), 1026-1037.
  Status = PUBLISHED; Acknowledgment of Federal Support = Yes

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Thesis/Dissertations

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  Acknowledgment of Federal Support = Yes

- Bishop, Pamela. *Impacts of an interdisciplinary research center on participant publication and collaboration activities*. (12/1/12). University of Tennessee.
  Acknowledgment of Federal Support = Yes

- Canner J. *Dissertation: The population ecology of ant-dispersed plants in space and time*. (5/1/10). North Carolina State University, Raleigh, NC.
  Acknowledgment of Federal Support = Yes

- Dall'Olio S. *PhD dissertation. Title not reported*. (5/1/13). Universita di Firenze, Firenze, Italy.
  Acknowledgment of Federal Support = Yes

- Gonzalez-Parra PA. *Dissertation: Optimal Control applied to a discrete influenza model*. (5/1/11). University of Texas, El Paso.
  Acknowledgment of Federal Support = Yes

- Hakansson N. *Network analysis and optimization of animal transports*. (5/1/12). Linkoping Studies in Science and Technology.

Acknowledgment of Federal Support = Yes

- Hughes JS. *Dissertation: Patterns and processes in forest insects population dynamics*. (5/1/13). University of Toronto.
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- Lennartsson J. *Networks and epidemics - impact of network structure on disease transmission*. (5/1/12). Linkoping University, Sweden.
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- Lewis CL. *Mathematical models with antibody and cytotoxic T lymphocyte responses due to hantavirus infections in rodents and humans*. (5/1/11). Texas Tech University.
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- Lindstrom T. *Dissertation: Spatial spread of organisms: Modelling ecological and epidemiological processes*. (5/1/10). Linkoping University, Sweden.
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- Logdberg F. *Population dynamics in variable environments - impacts of noise colour and synchrony*. (5/1/11). Linkoping University, Sweden.
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- Much K. *Undergraduate Honors Thesis: Mathematical modeling and sensitivity analysis of antibiotic resistance*. (5/1/10). Ursinus College.
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- Shah P. *Dissertation: On the evolution of codon usage bias*. (5/1/11). Univ. of Tennessee, Knoxville.
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Conference Papers and Presentations

- Simmerman S, Wang J, Osborne J, Shook K, Huang J, Godsoe W, Simons T (7/16/12). *Exploring similarities among many species distributions*. Proceedings of the 1st Conference of the Extreme Science and Engineering Discovery Environment 2012: Bridging from the eXtreme to the campus and beyond, article no. 38. Chicago, IL.
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Other Publications

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  Status = PUBLISHED; Acknowledgement of Federal Support = Yes

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  Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Technologies or Techniques

- Nothing to report.

Patents

Nothing to report.

Inventions

Nothing to report.

Licenses

Nothing to report.

Websites

Title: The NIMBioS Website
URL: http://nimbios.org/
Description: The NIMBioS website became operational October 1, 2008. Visitor traffic is monitored by Google Analytics. For the period October 1, 2008 through June 1, 2013, NIMBioS.org received 304,853 visits and 885,840 page views from 162,450 unique visitors, spending an average of 2.45 minutes on site and viewing an average of 2.91 pages per visit. For the year ending June 1, 2013, unique visitors increased 72%, site visits increased 47%, and pageviews increased 29% compared to the previous year. Thirty-two percent of visitors viewed a single page; 20 percent viewed more than 3 pages; 13 percent viewed more than 4 pages. Visits have originated from 9,756 cities in 202 countries/territories, using 146 languages. More than 50 percent of visits are identifiable as originating from colleges or universities. The site currently has 767 html pages and 630 pdf documents. An additional 67 html pages and 438 pdf documents were created for the 2012 Society for Mathematical Biology Annual Meeting and Conference website, hosted by NIMBioS. Pages with the highest visitor traffic include the front page, a press page feature article, personnel pages, calendar / announcements, education page, and pages describing research opportunities and activities for postdoctoral fellows, undergraduates, working groups, and workshops, and pages associated with SMB2012.

Title: Mathematical Modeling for the Cell Biology Researcher and Educator
URL: http://www.nimbios.org/wordpress-training/cellbiology/
Description: The site is a WordPress blog for the NIMBioS Tutorial: Mathematical Modeling for the Cell Biology Researcher and Educator, which was held April 8-10, 2013. The site was designed to facilitate group communication and information sharing before, during and after the tutorial.

Title: The NIMBioS Blog
URL: http://www.nimbios.org/wordpress/
Description: The NIMBioS blog is an interactive social media site established in August 2010 to showcase NIMBioS news and provide an outlet for readers' commentary.

Title: NIMBioS Investigative Workshop: Modeling Blood Cell Interactions
URL: http://www.nimbios.org/wordpress-training/bloodcell/
Description: The site is a WordPress blog for the NIMBioS Investigative Workshop: Modeling Blood Cell Interactions, which was held June 5-7, 2013. The site was designed to facilitate group communication and information sharing before, during and after the workshop.

Title: NIMBioS Twitter
URL: https://twitter.com/nimbios
Description: The NIMBioS Twitter account is an interactive social media site with 1,407 followers and 1,212 tweets (as of June 18, 2013) that feature NIMBioS news events and happenings as well as re-tweets of relevant news to the scientific community.

Title: NIMBioS Facebook
URL: https://www.facebook.com/nimbios
Description: NIMBioS Facebook page is an interactive social media site with 422 "likes" and posts that feature NIMBioS news, events and photos of interest to the NIMBioS Facebook community.

Title: NIMBioS Storify
URL: http://storify.com/NIMBioS
Description: The NIMBioS Storify site is an interactive social media site with stories created by NIMBioS that comprise all related URL content and photos.

Title: NIMBioS Flickr
URL: http://www.flickr.com/photos/nimbios/
Description: The NIMBioS Flickr features sets of photos from various NIMBioS activities and events, both formal and informal.

Other Products

Product Type: Audio or Video Products

Description: Video Interview. June 18, 2013. The Evolution of Cooperation. Shared via NIMBioS' YouTube account.
URL: http://youtu.be/4wbM3r_J3-k

Product Type: Audio or Video Products
Description: Video Interview. June 17, 2013. Talking to the Animals. Shared via NIMBioS' YouTube account.
URL: http://youtu.be/OdLk9RYiogs

Product Type: Audio or Video Products
Description: Workshop Video. June 17, 2013. Mechanics of diseased red blood cells: Bilayer-cytoskeletal interactions. Shared via NIMBioS' YouTube account. URL: http://youtu.be/GB0AOhD4SLI

Product Type: Audio or Video Products
Description: Workshop Video. June 17, 2013. Circulating tumor cell deformations modulate cell interactions with endothelium. Shared via NIMBioS' YouTube account. URL: http://youtu.be/eeoGU_8L-k0

Product Type: Audio or Video Products
Description: Workshop Video. June 14, 2013. A mechanochemical mechanism for rapid changes in cell shape. Shared via NIMBioS' YouTube account. URL: http://youtu.be/2G1x4VhxqzM

Product Type: Audio or Video Products
Description: Video Interview. June 13, 2013. Climate Change and Coastal Vegetation. Shared via NIMBioS' YouTube account. URL: http://youtu.be/im3kgKTfDj0

Product Type: Audio or Video Products
Description: Workshop Video. June 13, 2013. Roles of Rho GTPases in leukocyte and cancer cell transendothelial migration. Shared via NIMBioS' YouTube account. URL: http://youtu.be/4UyhA9Uzjco

Product Type: Audio or Video Products
Description: Workshop Video. June 12, 2013. Endothelial surface glycocalyx and tumor cell adhesion in the microvessel. Shared via NIMBioS' YouTube account. URL: http://youtu.be/Sj8q6W94NBI

Product Type: Audio or Video Products
Description: Video Interview. June 12, 2013. Movement Ecology. Shared via NIMBioS' YouTube account.
URL: http://youtu.be/9IX-lvpBriQ

Product Type: Audio or Video Products
Description: Workshop Video. June 12, 2013. Microstructure and rheology of cellular blood flow and platelet margination. Shared via NIMBioS' YouTube account. URL: http://youtu.be/9vE57Oo1GF8

Product Type: Audio or Video Products
Description: Workshop Video. June 11, 2013. Morphology and chirality control self-assembly of sickle hemaglobin inside a red blood cell. Shared via NIMBioS' YouTube account. URL: http://youtu.be/Y03mzLgki4Q

Product Type: Audio or Video Products
Description: Video Interview. June 11, 2013. Animal Networks. Shared via NIMBioS' YouTube account.
URL: http://youtu.be/_Dh-gL-Dn8s

Product Type: Audio or Video Products
Description: Workshop Video. June 11, 2013. Vascular remodeling in sickle cell disease large arteries. Shared via NIMBioS' YouTube account. URL: http://youtu.be/hvhIWHERzDc

Product Type: Audio or Video Products
Description: Workshop Video. June 10, 2013. Mechanosensing via a macromolecular complex initiated by tension on LFA-1 bonds. Shared via NIMBioS' YouTube account. URL: http://youtu.be/KKOfdBQzaAs

Product Type: Audio or Video Products
Description: Workshop Video. June 10, 2013. Multiscale and patient-specific blood systems biology. Shared via NIMBioS' YouTube account. URL: http://youtu.be/LmZxW6KXhXM

Product Type: Audio or Video Products
Description: Workshop Video. June 10, 2013. Integrating signaling with adhesive dynamics to simulate adhesion of blood cells. Shared via NIMBioS' YouTube account. URL: http://youtu.be/zNzcCzrgU6k

Product Type: Audio or Video Products
Description: Video Interview. May 31, 2013. Species and Climate Change. Shared via NIMBioS' YouTube account.
URL: http://youtu.be/fUCKSBMeNE8

Product Type: Audio or Video Products
Description: Seminar Video. April 19, 2013. Mathematical modeling of liver injury from acetaminophen overdose. Shared via NIMBioS' YouTube account. URL: http://youtu.be/gi3m6tNFnaI

Product Type: Audio or Video Products
Description: Seminar Video. April 18, 2013. War and space: Simulating the evolution of old world complex societies. Shared via NIMBioS' YouTube account. URL: War and space: Simulating the evolution of old world complex societies

Product Type: Audio or Video Products
Description: Seminar Video. April 17, 2013. Modeling the demography of a pre-Columbian Southwest U.S. population. Shared via NIMBioS' YouTube account. URL: http://youtu.be/b5HCS6lc44Q

Product Type: Audio or Video Products
Description: Seminar Video. April 3, 2013. Social networks in the hyrax and the hyena: from static to dynamic. Shared via NIMBioS' YouTube account. URL: http://youtu.be/oDbsVSorOLU

Product Type: Audio or Video Products
Description: Video Interview. March 21, 2013. Ecological causes of phenotypic selection and divergence. Shared via NIMBioS' YouTube account.

Product Type: Audio or Video Products
Description: Seminar Video. March 18, 2013. "Win-win" phenotypes in the evolution of incipient cooperation. Shared via NIMBioS' YouTube account. URL: http://youtu.be/xXuWdZuWs9U

Product Type: Audio or Video Products
Description: Workshop Video: March 18, 2013. A control theory approach to engineering biomolecular networks. Shared via NIMBioS' YouTube account. URL: http://youtu.be/bLxmX3Vaa_k

Product Type: Audio or Video Products
Description: Workshop Video. March 18, 2013. Understanding bacterial programmed death and implications. Shared via NIMBioS' YouTube account. URL: http://youtu.be/EOA4vbBguTk

Product Type: Audio or Video Products
Description: Workshop Video. March 18, 2013. Anticipating tipping points in biological populations: Cooperation, cheating, and collapse. Shared via NIMBioS' YouTube account. URL: http://youtu.be/s4oNIG7Fs5M

Product Type: Audio or Video Products
Description: Seminar Video. March 6, 2013. Species geographic response to past climate change and the evolution of multivariate systems. Shared via NIMBioS' YouTube account. URL: http://youtu.be/KQN0aehQ3aQ

Product Type: Audio or Video Products
Description: Seminar Video. Feb. 27, 2013. Allee effects and pest control. Shared via NIMBioS' YouTube account. URL: http://youtu.be/L2e5xt5Dwzc

Product Type: Audio or Video Products
Description: Seminar Video. Feb. 22, 2013. Estimating biting rates of triatomine on preferred sylvatic hosts in overlapping vector-host cycles. Shared via NIMBioS' YouTube account. URL: http://youtu.be/RwHj5Cq4un8

Product Type: Audio or Video Products
Description: Seminar Video. Feb. 15, 2013. Agent-based approach to malaria: Immunology, population genetics and evolution of virulence. Shared via NIMBioS' YouTube account. URL: http://youtu.be/9JHc2Q2Rxrg

Product Type: Audio or Video Products
Description: Seminar Video. Feb. 1, 2013. Species coexistence and spatial patterns in plant communities. Shared via NIMBioS' YouTube account. URL: http://youtu.be/47_6QCN7iBY

Product Type: Audio or Video Products
Description: Seminar Video. Jan. 31, 2013. The mathematics behind animal vocal communication. Shared via NIMBioS' YouTube account. URL: http://youtu.be/LgYKiN-kPrg

Product Type: Audio or Video Products
Description: Seminar Video. Jan. 30, 2013. The sound of fear: A journey from marmot meadows to Hollywood. Shared via NIMBioS' YouTube account. URL: http://youtu.be/YlmhZV1WhPA

Product Type: Software or Netware
Description: Berry M, Day J, Franklin M, Ganusov V, Koessler D, Martin J, Reardon C, Rempe C, Srinivasan S. 2012. Online Tutorial: Python for Biologists.

Product Type: Models
Description: Gurarie D. 2013. Reed-Frost SEIR Model (CDF tool for simulating SEIR systems with variable parameters). Wolfram Demonstrations Project.

Product Type: Software or Netware
Description: Gurarie D. 2013. Mathematica code for "Optimal control of dynamical systems (ODE and PDE)."

Product Type: compucell3d.org
Description: Swat M, Belmonte J, Hmeljak M, Heiland R, Sauro H et al. 2012. www.compucell3d.org

Product Type: Databases
Description: Turchin P, Storrs CT. 2012. Software: Historical Database of Sociocultural Evolution (SESHAT).

Product Type: WorkingWiki
Description: Worden L, Schreiber S, Bolnick D. 2010. WorkingWiki research and computation extension for MediaWiki. Developed at McMaster University.

Product Type: Educational aids or Curricula
Description: Banks D. 2011-2012. Undergraduate Course Offering: COSC 462 Parallel Programming. Univ. of Tennessee, Knoxville, TN.

Product Type: Educational aids or Curricula
Description: Cho E. 2010. Undergraduate Course: MAT 470 Mathematical Modeling. Kentucky State Univ., Frankfurt, KY.

Product Type: Educational aids or Curricula
Description: Glazier J. 2012. Class: Evolution in Cancer.

Product Type: Educational aids or Curricula
Description: Gurarie D. 2013. Whole-body physiology and diabetes: Modeling approach. Special Lecture at BME 480/580 (Computational Cell Biology class), Prof. Xiaopeng Zhao, University of Tennessee, Knoxville, TN.

Product Type: Educational aids or Curricula
Description: Riechert S. August 2011. Cocke County and Jefferson County K-12 teacher training.

Product Type: Educational aids or Curricula
Description: Riechert S. August 2011. Crockett County K-12 teacher training, Alamo City Schools.

Product Type: Educational aids or Curricula
Description: Riechert S. January 2012. Hamilton County K-12 teacher training.

Product Type: Educational aids or Curricula
Description: Riechert S. August 2011. Haywood County K-12 teacher training.

Product Type: Educational aids or Curricula
Description: Riechert S. September 2011. K-12 teacher and non-formal educator training, TN Outdoor Classroom Symposium and TEEA Conference, Johnson City, TN.

Product Type: Educational aids or Curricula
Description: Riechert S. November 2011. K-12 teacher training, TSTA Conference, Murfreesboro, TN.

Product Type: Educational aids or Curricula
Description: Riechert S. September 2011. LEADS Conference administrator and superintendent training, Nashville, TN..

Product Type: Educational aids or Curricula
Description: Riechert S. December 2011. Moore Country K-12 teacher training.

Product Type: Educational aids or Curricula
Description: Riechert S. December 2011. Polk County K-12 teacher training.

Product Type: Educational aids or Curricula
Description: Riechert S. December 2011. Teacher & administration training, East Tennessee Title One Conference, Gatlinburg, TN.

Product Type: Educational aids or Curricula
Description: Riechert S. 2013. Biology in a Box Unit #10: Behavior.

Product Type: Module: Optimal litter size
Description: Ryan P. 2011. Module: Optimal litter size. Truman State University.

Product Type: Educational aids or Curricula
Description: Ryan P. 2011. Computer Lab: Curve fitting and biological modeling. Truman State University's Introduction to Mathematical Biology course.

Product Type: Golf Course Habitat Improvement
Description: Wallrichs, M. 2010. Golf Course Habitat Improvement for Bat Conservation (DE/MD) (includes monitoring for WNS). Delaware State University, Dover, DE.

Product Type: Survey Instruments
Description: Participant Demographic Survey. This survey was designed by the NIMBioS Evaluation Manager and collects basic demographic data to gauge whether our program is fairly reaching and benefitting everyone regardless of demographic category and to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities, and to assess involvement of international participants in the program. Submission of the requested demographic information by participants is voluntary and does not affect the participant's eligibility for selection into NIMBioS events. Anonymized information from the survey is shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other

reporting capacities for the purpose of program assessment.

Product Type: Survey Instruments
Description: Program Evaluation Surveys. These surveys was designed by the NIMBioS Evaluation Manager and collects information directly from participants after each NIMBioS event and contribute the evaluation of the institute as a whole. Questions on the surveys focus on a number of event-specific areas, to include: participant satisfaction in a number of areas, appropriateness of content, meeting of expectations, knowledge gains, progress toward stated goals, impact on future research, impact on career choice, impact on collaborative activities. Anonymized information from the survey is shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other reporting capacities for the purpose of program assessment.

Product Type: Databases
Description: NIMBioS Participant Database. The NIMBioS participant database was designed by the NIMBioS Evaluation Manager and is used to store and query information about participant demographics, events, and scholarly products arising from these events. The database is shared internally among NIMBioS staff and the Leadership Team, and data from the database are shared with the National Science Foundation, the NIMBioS Advisory Board, Site Review Teams, and in other reporting capacities for the purpose of program assessment.

This supporting file contains:
Figure 1. Diversity of scientific topics represented in NIMBioS activities.
Table 1. Number of articles related to NIMBioS activities published in top national and international journals in 2012-2013.
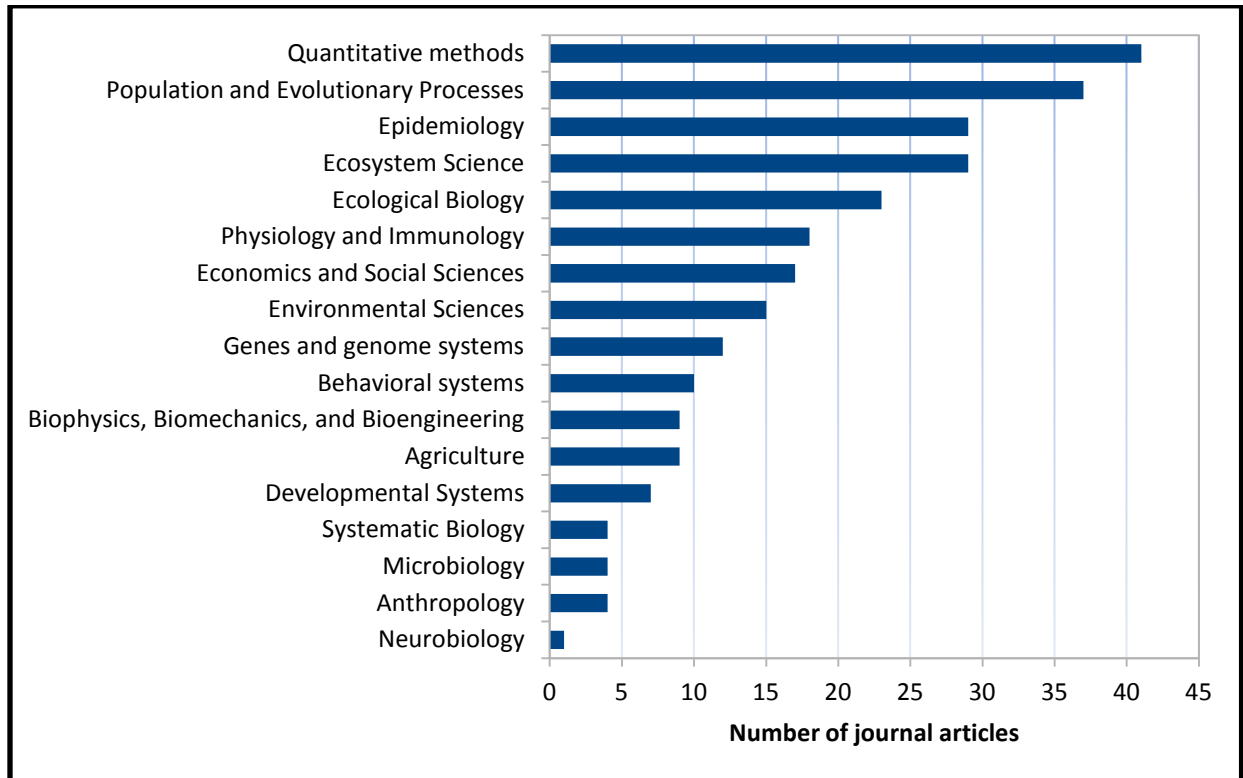
Figure 1. Diversity of scientific topics represented in NIMBioS activities. This figure illustrates the diversity of scientific topics covered by NIMBioS-supported activities using the data on the frequencies at which different subject areas were represented in 130 journal articles published in 2012-2013. Note that each article was assigned up to 3 different subject categories.

Table 1. Number of articles related to NIMBioS activities published in top national and international journals in 2012-2013.

Journal Title	5-Year Impact Factor	# Publications in Year 5
Nature	38.159	1
Science	33.587	1
Ecology Letters	18.495	2
Trends in Ecology and Evolution	17.112	1
Proceedings of the National Academy of Sciences	10.583	3
PLoS Genetics	9.44	1
Philosophical Trans of the Royal Society B-Biological Sciences	7.298	1
Ecology	6.372	2
PLoS Computational Biology	5.939	2
Proceedings of the Royal Society B-Biological Sciences	5.832	3
Evolution	5.402	2
American Naturalist	5.332	3
Journal of the Royal Society Interface	5.165	3
PLoS One	4.244	6
Animal Behaviour	3.405	3

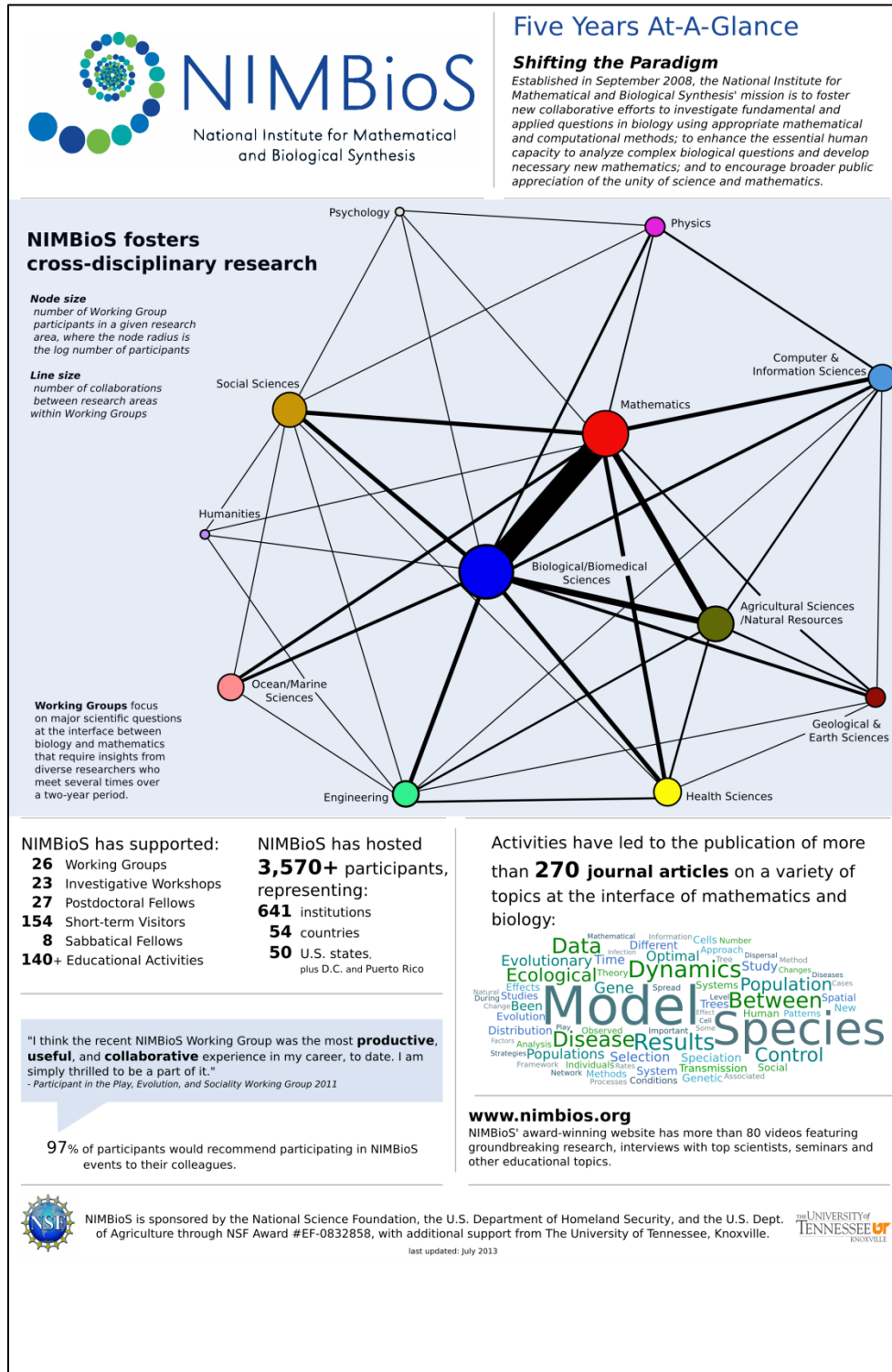This supporting file contains: Figure 2. NIMBioS At-A-Glance Infographic

**Figure 2**. NIMBioS At-A-Glance Infographic, covering the period September 2009 - June 2013.

This supporting file contains Table 2 and Figure 3, which show an overall trend of increasing *nimbios.org* website visits and unique visitors through the reporting periods (site use data from Google Analytics).

Table 2. Number of *nimbios.org* website visits and unique visitors for NIMBioS reporting years (site use data from Google Analytics).
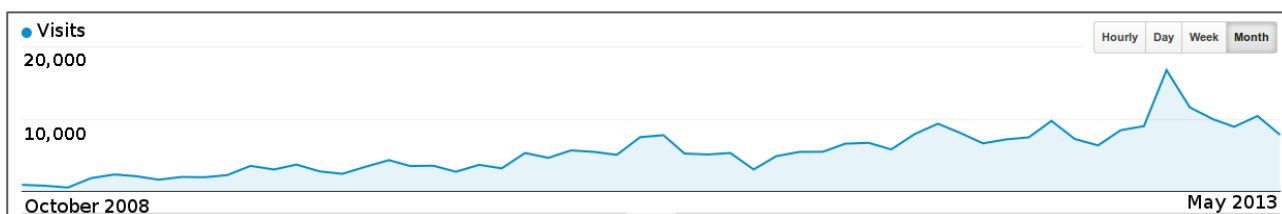
Reporting year	Unique visitors	Visits
Sep 1, 2008 – Aug 31, 2009	9259	19951
Sep 1, 2009 – Aug 31, 2010	21278	41700
Sep 1, 2010 – Aug 31, 2011	33449	65208
Sep 1, 2011 - Aug 31, 2012	45084	88398
Sep 1, 2012 – May 31, 2013*	58587	89596

*Partial year

(a)
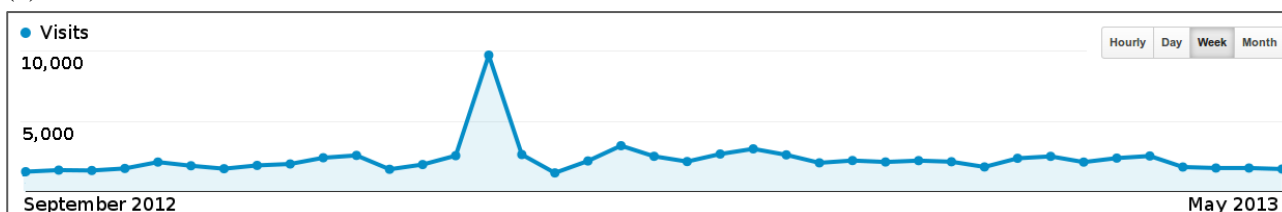
(b)

Figure 3. Number of *nimbios.org* website visits for (a) the 2013 reporting year (weekly, September 1, 2012 through May 31, 2013) and (b) monthly for the period October 1, 2008 through May 31, 2013. The peaks in Figure 3(a) show the impact of significant products on the number of website visits in the reporting period. Figure 3 (b) documents the overall increasing trend in visits since the inception of NIMBioS (site use data from Google Analytics).