2017 Annual Report

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 to assist in 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. NIMBioSis structured to efficiently useNSF 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 efforts have included a variety of strategies to achieve the above goals, based upon the successes of our leadership team in developing new interdisciplinary collaborations nationally and internationally and uponthe successful efforts at other NSF-supported Synthesis Centers. A major goal has been to encourage the development of small Working Groups, which focus 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 useful in biological applications; connections to institutions serving under-represented groups; a summer research experience program targeted at undergraduates and high school teachers; 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 that involve large datasets, spatial information, and dynamics. A further objective is to assist mathematicians in identifying new mathematical challenges arising from current biological research.

The questions addressed by NIMBioS span all of biology, impacting both basic and applied science. Hence, the impacts are wide-ranging from those arising due to the application of specific models to particular challenges, such as controlling zoonotic disease spread, 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, a particular emphasis of which has included issues arising from infectious diseases 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, 2016 through August 31, 2017, NIMBioS hosted (or will host this summer) 18 meetings of 16 different Working Groups, three Investigative Workshops, and three Tutorials, and five additional workshops. There are projected to be over 800 participants in NIMBioS-hosted activities during this period with 8 Postdoctoral Fellows in residence, 26 Short-term Visitors, and one Visiting Graduate Fellow.

The Working Groups that metduring this period were: Modeling Organisms-to-Ecosystems (September 2016), Teaching Quantitative Biology (October 2016, May 2017), Remote Sensing Biodiversity (October 2016), Spatial Cell Simulation (October 2016, March 2017), Caulobacter Cell-Cycle Model (October 2016), Leptospirosis Modeling (November 2016),Ecological Network Dynamics (November 2016),Modeling Molecules-to-Organisms (November/December 2016),Prediction and Control of Cardiac Alternans (December 2016), Multiscale Vectored Plant Viruses (December 2016),Models of Produce Contamination (January 2017),Vector Movement and Disease (January/February 2017), Long Transients and Ecological Forecasting (March 2017), 3D Modeling of Human Body Composition (March 2017), Optimal Control of Neglected Tropical Diseases (May 2017), and Ecosystem Federalism (June 2017).

The Investigative Workshops were: Next Generation Genetic Monitoring (November 2016), Species' Range Shifts in a Warming World (May 2017), and Pan-microbial Trait Ecology (June 2017). Additional workshops that NIMBioS has contributed through collaborations included the 2016 Blackwell-Tapia Conference and Award Ceremony (October 2016), the NSF INCLUDES Conference on Multi-scale Evaluation in STEM Education (February 2017), and the Joint NIMBioS-MBI-CAMBAM Summer Graduate Program on Connecting Biological Data with Mathematical Models (June 2017). As we move to sustainment of these key programs, we will increase our efforts in reaching out to potential collaborative workshops as this is an effective approach in financial support for workshop.

The Tutorials were: Modern Methods in Program Evaluation (February 2017), Uncertainty Quantification for Biological Models (June 2017), and Phylogenetic Analysis Using RevBayes (August 2017).

Demographics data available for participants in events from September 1, 2016 through April 30, 2017 are presented in detail in the NIMBioS Evaluation Report (see section Y9-2 of the attached addendum to this Annual Report) and summarized below. There were 589 participants through April 30, 2017 from 19 countries and 42 U.S. states as well as the District of Columbia representing 187 different institutions. International participants amounted to 14% of all participants. Most participants were college or university faculty (50%), but undergraduates (10%), graduate students (5%), and post-doctoral researchers (6%) accounted for a significant fraction of participants. Across all events female representation was 44%, and minority representation was near 18%. Representation of various minority categories was slightly above levels of minority representation for doctoral recipients in the biological sciences and the mathematical sciences.

Short-term Visitors from September 1, 2016 through April 30, 2017 were from 21 different institutions and collaborated with NIMBioS post-doctoral fellows, faculty from four University of Tennessee departments, and 11 external researchers.

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 twice virtually during this reporting period, evaluating 14 requests for Working Groups and Investigative Workshops of which six were approved. The Board also evaluated 18 requests for a postdoctoral fellowship in the area of Spatial Modeling of which two were supported and one accepted an offer. All of these major activities facilitate development of interdisciplinary collaborationsin mathematical biology.

A 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. The Biology in a Box program, Girls in Science, SHADES (Sharing Adventures in Engineering and Science), and Adventures in STEM Camp (Science, Technology, Engineering, and Mathematics) are all examples of efforts to reach out to K-12 students and pique their interest in math and the sciences. Combined, NIMBioS' teacher collaboration and math/biology curriculum programs, Junior Science and Humanities Symposium, and the Summer Research Experience (SRE) for undergraduates help participants gain the skills and make the connections between mathematics and biology that are a core component of the NIMBioS mission.

NIMBioS hosted the 2017 Summer Research Experience for undergraduates program, which included 16 undergraduates in math and biology fields from 13 different institutions and a high school biology teacher. The students engaged in team research

projects in one of five different topics including using mating patterns in birds' evolutions, multi-host systems with seasonality, modeling La Crosse virus, modeling immune responses to viral infections, and developing computer games for teaching biology. The goal of these programs is to further enhance the students' abilities to independently and as part of a team develop quantitative approaches to answering biological questions. An indicator of the success of the NIMBioS SRE program is the progression of many former participants into doctoral programs in STEM fields.

In fall 2016, NIMBioS hosted its eighth annual undergraduate research conference at the interface of math and biology, which included more than 50 undergraduate research talks and posters and was attended by more than 110 students and faculty from academic institutions across North America.

Graduate students have been regular participants in many NIMBioS research activities, particularly workshops, tutorials, and short-term visits. NIMBioS co-organized, jointly with the Mathematical Biosciences Institute and the Centre for Applied Mathematics in Bioscience and Medicine, a Summer Graduate Research Workshop on Connecting Biological Data with Mathematical Models. NIMBioS supported four University of Tennessee graduate students to carry out research in collaboration with NIMBioS post-docs and researchers and to provide assistance with specific programs. The Visiting Graduate Fellow program allows graduate students from outside the University of Tennessee to come for a longer visit to collaborate with NIMBioS post-docs and University of Tennessee faculty.

Postdoctoral Fellows at NIMBioS are independent researchers who develop their own proposed research activity and receive mentoring from both a mathematical sciences and a biological sciences faculty member. There were 8 Postdoctoral Fellows in residence for at least part of this reporting period. An objective of NIMBioS is to enhance career opportunities for current and former Postdoctoral Fellows, and career development seminars and workshops are held regularly. One of these postdocs has moved on to a position in the US Forest Service; the rest remain in residence.

Significant Results:

NIMBioS relies upon participants to self-report products that were derived from their participation in NIMBioS activities. There were a total of 446 products reported from the time of preparation of the September 2015 - August 2016 annual report (May 2016) and April 30, 2017, including 161 journal articles, 2 book chapters, 1 book, 244 conference papers and presentations, 5 software/netware/data and research materials, 15 grant requests, 4 educational aids or curricula, 8 meetings, workshops or symposiums, and 6 other products or publications. Details on publications in journals, books, and conference proceedings are included in the Products section; details on featured articles, websites, and media coverage are included as Additional Products in Section Y9-5 of the Addendum to this annual report.

Since inception NIMBioS-supported activities have resulted in publications in a broad

range of topics as designated by ISI Web of Science categories. The most common subject category in which NIMBioS publications fell was Ecology (204), followed by Evolutionary Biology (14), Biology (103), Mathematical & Computational Biology (100), Multidisciplinary Sciences (92), and Genetics & Heredity (58).Figure 1 (provided as an attached supporting file to this section) illustrates the diversity of scientific topics covered by working groups and workshops hosted by NIMBioS between September 1, 2016 and April 30, 2017 (more information on interpretation of this figure is available in the NIMBioS Evaluation Report, Section Y9-2 of the addendum to this annual report - see Figure 2 and associated text in Section Y9-2).

A number of the publications resulting from NIMBioS activities this reporting period appeared in top national and international journals with high impact factors, including Trends in Ecology and Evolution, Ecology Letters, Proceedings of the National Academy of Sciences, Philosophical Transactions of the Royal Society B – Biological Sciences, Molecular Ecology, Ecology, Proceedings of the Royal Society B – Biological Sciences, and PLoS ONE. Table 1 in the supporting file included with this section provides details on NIMBioS-derived publications in certain high-impact journals during this reporting period and since inception.

Key outcomes or Other achievements:

Metrics of success for NIMBioS include establishing new connections between researchers from diverse backgrounds leading to new interdisciplinary science. Illustrations of the outcomes NIMBioS has in this regard appear in Figure 2 (attached as a supporting file for this section). Figure 2 shows the fields of expertise of participants in NIMBioS Working Groups during the current reporting period and the connections fostered between individuals with different backgrounds by participation in the 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 biological/biomedical sciences and mathematical sciences, there are a number of participants from the social sciences, marine sciences, health sciences, education, engineering, and others. As the width of the connecting line segments in this graphic illustrates, these NIMBioS Working Groups have generated a 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. The NIMBioS evaluation program follows the CIPP systems approach (Context, Inputs, Process, Products), which takes into account not only the outcomes of the Center, but also how the outcomes are achieved. The Process Evaluation seeks to evaluate congruence between goals and activities, monitoring and judging activities at NIMBioS, mainly through periodic evaluative feedback surveys from participants and organizers. 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. Previous evaluation case studies found 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 Web of Science subject categories toward mathematical fields. A current evaluation case study examines the growth and productivity of NIMBioS working group teams using social network analysis, bibliometric measures, and psychometric surveys regarding views and experiences with interdisciplinary research. Preliminary results suggest:

- Network density (collaboration) among working group participants increases with each subsequent meeting

- Collaboration patterns change drastically among group members from before they are brought together and after. The more time that passes between meetings, the more the collaboration patterns change (i.e. who is collaborating academically with whom).

- Participants tend to collaborate more with those (1) of their own gender, (2) who physically attend meetings together, (3) knew each other prior to the formation of the group, (4) had collaborated before the group started

- Participants collaborate more outside of their own gender, professional status, field of study, and country the more we bring them together.

A multi-level model analysis of the network characteristics and individual productivity found that females were more productive when they were in groups with female leaders (an increase in co-authorship rate of 33% for each additional female leader), and that the same connection did not hold true for minorities in minority-led groups. This project is now being extended to include more working groups and participants and analysis is currently underway.

Growing out of the evaluation program implemented at NIMBioS, Dr. Pamela Bishop has taken the lead to create a collaborative STEM education and research evaluation service center under the NIMBioS umbrella. The Vice Chancellor for Research and Engagement approved the National Institute for STEM Evaluation and Research (NISER) to function as a Center within NIMBioS. Dr. Bishop has collaborated on more than 60 research proposals across more than 25 institutions, and NISER already reached more than one million in grant revenue. This has enabled Dr. Bishop in the last year to hire two research associates and a postdoctoral fellow to staff the center. The challenge in this growth area is the sustainment of Dr. Bishop who is currently operating as NISER Director on a “soft line.” While her contributions to overseeing and contributing to grant funded activities

can be covered by the soft funds she brings in, her duties as an administrator (e.g. business development, proposal writing, staff and budgetary management) will need to be covered by other resources after NIMBioS prime funding ends.

Accomplishments of the center to date include the following:

Collaboration on more than 60 grant proposals. Ten proposals have been awarded, totaling around $1,122K. Currently, 10 proposals are under review, and 3 are in the process of being written. Additionally, two major University of Tennessee STEM education projects (NIH funded PEER and PIPES projects) are transferring existing evaluation contracts to NISER for the rest of the project lifespans.

In February 2016, NISER hosted an NSF INCLUDES-sponsored Evaluation 101 webinar, a tutorial on getting started with evaluation (~40 people), and a conference focused on multi-scale, multi-site evaluation (additional ~60 people). Invited speakers from across the country included STEM evaluation experts, broadening participation experts, and multi-site, multi-scale evaluation experts.

P. Bishop was invited to an HHMI Constellation Studio meeting about quantitative biology education, which was hosted by Paul Overvoorde (Biology, Macalaster University) and MuhammedZaman (Boston University, Biomedical Engineering). She led a working group about developing a community survey about the status of biology faculty with regard to teaching/integrating quantitative concepts into their intro biology courses. This has resulted in collaboration with several biology education folks from multiple universities on the development of a community survey to determine the state of quantitative biology teaching in the United States.

Two research projects are underway: one in collaboration with investigators from the Quantitative Biology Education and Synthesis (QUBES) project on the roadblocks and incentives of biology faculty to contribute to and use open educational resources; and one study looking at 35 completed working groups with 458 participants using HLM to examine the group and individual level diversity factors that may influence productivity (described in more detail above).

P. Bishop has collaborated on two research articles that have been published/in press since the inception of NISER:

Hampton, S.E., Halpern, B.S., Winter, M., Balch, J.K., Parker, J.N., Baron, J.S., Palmer, M., Schildhauer, Bishop P.R., M.P., Meagher, T.R., and Specht, A. (2016) Best practices

for virtual participation in meetings: experiences from synthesis centers. The Bulletin of the Ecological Society of America 98(1): 57-63

Baron, J., Specht, A., Garnier, E., Bishop, P., Campbell, C., Davis, F., Fady, B., Field, D., Gross, L., Guru, S., Halpern,B., Hampton, S., Leavitt, P., Meagher, T., Ometto, J., Parker, J. Price, R., Rawson, C., Rodrigo, A,, Sheble, L., and Winter, M. (In Press) Synthesis Centers as Critical Research Infrastructure. Bioscience.

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

NIMBioS carries out extensive training and professional development activities. We provide some highlights here, but see the detailed listing of activities during this reporting period in Section Y9-4 of the Annual Report Addendum.

Postdoctoral Fellows

Postdoctoral Fellows at NIMBioS are independent researchers who develop their own proposed research activity and receive mentoring from both a mathematical sciences and a biological sciences faculty member. There were 8 Postdoctoral Fellows in residence for at least part of this reporting period. A NIMBioS objective is to enhance career opportunities for current and former Postdoctoral Fellows, and career development seminars and workshops are held regularly. One of these postdocs has moved to a position in the US Forest Service; the rest remain in residence.

NIMBioS provides a Postdoctoral Professional Development Seminar series for the Fellows during the academic year and gives the Fellows additional opportunities to explore and discuss shared professional development issues with faculty and staff from around the University. Often the ratio of Fellow to faculty in these discussions will be between 2:1 and 3:1 enabling a rich discussion environment in which the Fellows can explore questions and ideas they have. Topics for the series are typically suggested by the postdoctoral Fellows themselves. The most frequently requested topics concern aspects of the job application and interview process, which was the subject of two seminars during this reporting period. Teams of Fellows and their mentors are involved in the design of some of these professional development sessions. Several post-docs initiated a program for mentoring female post-docs in science as well as participated in departmental discussions about challenges to diversity in science. New post-docs participate in a training session on how to communicate their science to the media and to non-scientific audiences; topics included using social media, talking to a reporter, on-camera interviewing, and poster and slide presentation tips. Postdoctoral Fellows are informed of other opportunities (e.g., workshops, short-courses, web sites and other information relevant to professional development) occurring on campus and elsewhere. All Postdoctoral Fellows are asked to complete online profiles that require them to succinctly describe their work. Postdoctoral Fellows are provided with a travel allowance to promote their development as scientists and for career development.

Presentations by post-docs are included with Other Products in the Products section of this report.

Annual reviews of Postdoctoral Fellows focus on professional and scientific development. Manuscript submission is an expected goal for all Fellows; 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.

Graduate students

During AY16-17, NIMBioS funded four UTK graduate student research fellowships using recovered F&A funds. Two male and two female students are pursuing degrees in Chemical Engineering, Ecology and Evolutionary Biology, and Microbiology. They were granted research awards based on an internal annual competitive application process. They performed research in the areas of computational methods to investigate interactions of a T cell with an antigen-presenting cell; use of differential equations to examine kinetics of HIV evolution; mathematical and computational methods to infer protein properties and their evolution; and development of a new continuous biogeography model to infer ancestral geographic range. Collectively, they presented at national conferences and have 1 (R. Pullen) published manuscripts, 3 (C. Lander, K. Massana, and R. Pullen) under review and 1 (C. Lander) in revision. K. Massana successfully defended her PhD in Ecology and Evolutionary Biology in Spring 2017. All participated in NIMBioS-related K-12 outreach activities. Two additional graduate students worked on projects related to the National Institute for STEM Evaluation and Research, formerly NIMBioS Evaluation Services. NIMBioS hosted T.Miyaoki (Applied Mathematics, University of Campinas, Brazil), a self-supported Visiting Graduate Fellow collaborating on a project with NIMBioS postdoc N.Siewe and NIMBioS Associate Director for Education & Outreach S. Lenhart on applying control techniques to Zika models. T. Miyaoki is visiting from May-December 2017.

Our tutorials provide training on specific research tools for all groups but are important for graduate student professional development. The Uncertainty Quantification for Biological Models tutorial in June will help students understand quantitative methods used to characterize and reduce uncertainties in mathematical models. The RevBayes tutorial in August will introduce students to RevBayes, an exciting new program for Bayesian inference of phylogeny.

The NIMBioS–MBI–CAMBAM Summer Graduate Program on Connecting Biological Data to Mathematical Models in June 2017 will train graduate students in model formulation, sensitivity analysis and parameter estimation. Students will work on corresponding computer sessions to learn techniques and will receive feedback on their research projects.

Undergraduates

Our 2016 Summer Research Experiences (SRE) for Undergraduates program provided training in research procedures, mathematical modeling, R and MATLAB programming, and poster and oral presentations. SRE professional development activities include sessions on career opportunities, graduate school applications, cross-cultural mentoring, media training and teamwork, including the use of self-assessments.

Our Undergraduate Research Conference at the Interface of Biology and Mathematics exposed undergraduates and mentors to a variety of research topics; advice on graduate school and career opportunities were presented in a panel discussion and in a graduate school fair, which included representatives from several graduate programs.

Our new initiative involving STEM undergraduates with disabilities provided activities to build a community and to provide career advice and skills for being successful in obtaining their degrees. The program is partially funded through a subcontract through the NSF INCLUDES program called the Southeast Alliance for Persons with Disabilities in STEM, which is centered at Auburn University.

Sustainability

The RevBayes tutorial in August 2017 is a ‘trial’ tutorial in which participants pay their expenses and a small registration fee. The registration fees cover expenses of organizers and some NIMBioS expenses. We plan to host more of these types of tutorials and adapt them as needed in the future. We also plan to pursue funding through grants and other government or industrial sources to support tutorials.

An NSF proposal to obtain for our undergraduate conference has been submitted. Proposals for funding to extend the NIMBioS undergraduate summer research program will also be submitted. We are collaborating with the UT Center for Wildlife Health on one such proposal. Other funding sources such as the National Security Agency will be considered.

We will continue to seek funding for teacher workshops on STEM activities involving modeling, and we will seek funding for a workshop to investigate current practices of STEM teacher professional development and their impact.

We will seek follow-up funding for our NSF EAGER grant to formulate a calculus concept

inventory with biological applications. Further work needs to be done to evaluate this inventory as a tool to assess quantitative concept learning goals in the context of life science data examples and models. L. Gross, P. Bishop, S. Lenhart, K. Sturner, and R. Taylor worked on this project.

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

The award-winning website of the National Institute for Mathematical and Biological Synthesis (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 April 2017, the website contained 1405 pages and 1649 pdf documents. Table 2 and Figure 3 (appended to end of this section) illustrate trends in the number of site visits over the current reporting period and over the full range of NIMBioS operation. 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 posts or leaving 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 the NIMBioS mission and activities. It also provides a comprehensive listing of research results via NIMBioS "products," including publications, presentations, proposals, scientific meetings generated by NIMBioS activities, educational products, and data and software. 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." The newsletter includes a science story, an education and outreach-related feature, links to videos from the library of NIMBioS-produced videos, and a listing of future educational and research opportunities. As of May 2017, there are more than 6,500 subscribers, and the newsletter typically has an average click-through rate well above industry standards 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 to a more internal audience with a listing of the next week's events and visiting scientists.

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 400

NIMBioS-produced videos featuring groundbreaking research, interviews with top scientists, seminars, workshops, tutorials and other educational topics. The videos are hosted on the NIMBioS YouTube channel, which has more than 700 subscribers, and are also featured on the NIMBioS website.

NIMBioS provides live streaming of many of its events, including workshops, tutorials and seminars. Live streaming is accessed through the NIMBioS website via a log-in page, and a live chat window is also provided. Viewer discussion is promoted via Twitter hashtags.

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. NIMBioS also collaborates with the media office at the University of Tennessee, Knoxville, as well as the press offices of visiting scientists' institutions, in order to increase dissemination of research results via press releases.

Press releases derived from NIMBioS activities have led to news coverage in local, regional, national and international press including Science, Nature, The New York Times, the Los Angeles Times, National Public Radio, and many other outlets.

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

In addition, NIMBioS gives workshop and tutorial organizers the option to have NIMBioS create and maintain a WordPress site for each workshop and tutorial. The site facilitates group communication and information sharing for the workshop/tutorial, and is accessible for informational purposes to individuals not participating in the workshop.

Finally, aside from NIMBioS' multimedia channels and communication activities, NIMBioS undertakes numerous outreach activities via the NIMBioS Education and Outreach office. These include presentations and exhibits about our activities at professional meetings, such as the Joint Mathematics Meeting, the Society for the Advancement of Chicanos and Native Americans in Science, and the National Science Teacher's Association. It also includes outreach to the general public, such as the presentation of a special NIMBioS math and biology award at the regional science fair and coordinating activities for the Sharing Adventures in Science and Engineering (SHADES) event. For a complete listing of all of our outreach activities during the reporting period, please see the Section Y9-4 Description of Activities in the Addendum.

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

In its tenth year of support from NSF, NIMBioS will continue to promote and implement its vision and mission to; (1) Foster new collaborative efforts to investigate fundamental and applied questions arising in biology using appropriate mathematical and computational methods; (2) Enhance the essential human capacity to analyze complex biological questions and develop necessary new mathematics; and (3) Encourage broader public appreciation of the unity of science and mathematics. Several new endeavors are being developed/explored to enhance NIMBioS' mission, including expansion of the National Institute for STEM Evaluation and Research (NISER), development of the Spatial Analysis Laboratory (SAL), and exploration of a potential Mathematical Modeling Consulting Center (MMCC).

Workshops, Working Groups, and Tutorials. An important part of the effort to foster new collaborative activities is supporting and hosting community-driven workshops and working groups. NIMBioS will host at least two new workshops and four new working groups in the next reporting period using NSF funds, in addition to on-going working groups from prior years. Maintaining these types of activities is part of NIMBioS' core, and a significant effort is being made on two fronts to find funds to support them. One front is encouraging and facilitating inclusion of NIMBioS-hosted workshops, tutorials, and working groups in grant submissions. A second front is implementing a registration-fee model where costs of hosting a workshop or tutorial are covered by registration fees paid by participants. As discussed in the various sections of the annual report, these efforts are at various stages of development, but we have developed websites and application processes and will begin advertising these opportunities this summer. At least three grant proposals that include support for activities at NIMBioS have been submitted to date; if successful these will support activities next year.

Postdoctoral Fellows and Faculty. NIMBioS will continue to enhance the human capacity in all of our programs. We have made a concerted effort to attract postdoctoral fellows aligning with two of the new areas we are fostering, spatial biology and computational biology (molecular and cellular). New faculty M. Papes and T. Hong were hired into the departments of Ecology and Evolutionary Biology (EEB) and Biochemistry, Cellular and Molecular Biology (BCMB), respectively. These are new research focus areas for the departments. Two recent calls for NIMBioS postdoctoral fellows aligned with these areas broadly, and we expect new postdoctoral fellows in each area to join NIMBioS in fall 2017. We also expect to add a new NIMBioS-affiliated faculty member in Microbiology.

Spatial Analysis Laboratory. M. Papes will lead the development of the Spatial Analysis Laboratory (SAL) as a recharge center that will be available to the fellows and serve as a local, regional and national resource. We have worked collaboratively with EEB, the Department of Geography, and the Office of Research to equip the lab with a terrestrial LIDAR unit and a drone for surveillance. The lab will provide the ability to accumulate large, spatially explicit datasets (big data) and the development of new technologies (e.g. Unmanned Aerial Systems) and thereby expand the scope of analyses and bridging across disciplines. A recent Incubator event began the process to promote collaborations with SAL and diverse groups of researchers and stakeholders in East Tennessee with the aim of identifying a set of societal issues in the region

that could be addressed by leveraging large, spatially explicit datasets and by adopting the interdisciplinary action approach. M. Papes and E. Carr have begun coalescing a community of scholars to disseminate information and bridge funding opportunities, through partnerships with stakeholders. The role of SAL will be pivotal in providing the infrastructure and talent to solve problems that require broad geographic extent, long-term data and collaborations between researchers from various disciplines and stakeholders. The convergence of ideas, tools, and technologies from various fields has been identified by NSF as one of the 10 Big Ideas for the coming decades. Convergent research is possible through collaborations of universities with state and federal agencies, industry, and private foundations. SAL will seek to foster these partnerships

National Institute for STEM Evaluation and Research. The Vice Chancellor for Research and Engagement approved the National Institute for STEM Evaluation and Research (NISER) to function as a Center within NIMBioS. NISER is an outgrowth of NIMBioS Evaluation Services. P. Bishop is directing this Center, which ties directly to NIMBioS' mission in STEM education and research. The Center has grown to the point of hiring two research associates and a postdoctoral fellow. During the next reporting period, we expect to take further steps to enhance the capabilities and growth of NISER.

Mathematical Modeling Consulting Center. The MMCC is a potential consulting center to operate within NIMBioS. It would take its inspiration from existing statistical consulting centers thriving at other universities and expand the research capabilities of researchers who need modeling expertise as opposed to statistical expertise. Researchers would come to the Center and be paired with modelers to discuss models and modeling approaches that could aid their research. The consulting center would potentially tie a community of postdoctoral fellows together, provide them mentorship opportunities, and enhance outreach and training experiences. We expect discussion during the next reporting period among NIMBioS leadership and N. Fefferman to explore the feasibility of launching this idea.

Infectious Disease Modeling. Modeling of infectious diseases is an area of strength for NIMBioS and an area in which we have been actively networking and building collaborative relationships. C. Jonsson gathered a group of scientists from UTK, ORNL and UTHSC-Memphis to discuss potential paths to collaboration in current problems in host-pathogen interactions during the March 2017 incubator event at NIMBioS and expects further collaborations to develop from this over the next year. C. Jonsson submitted an NIH U19 proposal in spring 2017 to create a Center for Systems Biology of Host-Pneumonia Interactions, or Pneum-Omics Center. If funded, NIMBioS would largely manage the administrative core of this Center, facilitating interactions, communications and logistics within the Center, between other Centers, and/or NIH; and leading outreach to the broader scientific community.

Director Transition. Director Jonsson announced in April that she will be stepping down as director as of June 30, 2017. Dr. Jonsson is working on documents to ensure a smooth transition of information. Meanwhile Dr. T. Eighmy, University of Tennessee Vice-Chancellor for Research has met with the NIMBioS Leadership Team to plan a process for attracting and appointing a new director via an internal search. Dr. Eighmy has solicited nominations from the NIMBioS community. Applicants will meet with the NIMBioS Leadership Team and Dr. J.

Velasco-Hernandez, Chair of the NIMBioS Advisory Board in May. The Leadership Team and Dr. Velasco-Hernandez will make recommendations on the top applicants to Dr. Eighmy, Provost J. Zomchick, and Dean of Arts and Sciences T. Lee. The Vice-Chancellor, Provost, and Dean will consult to select the next director.

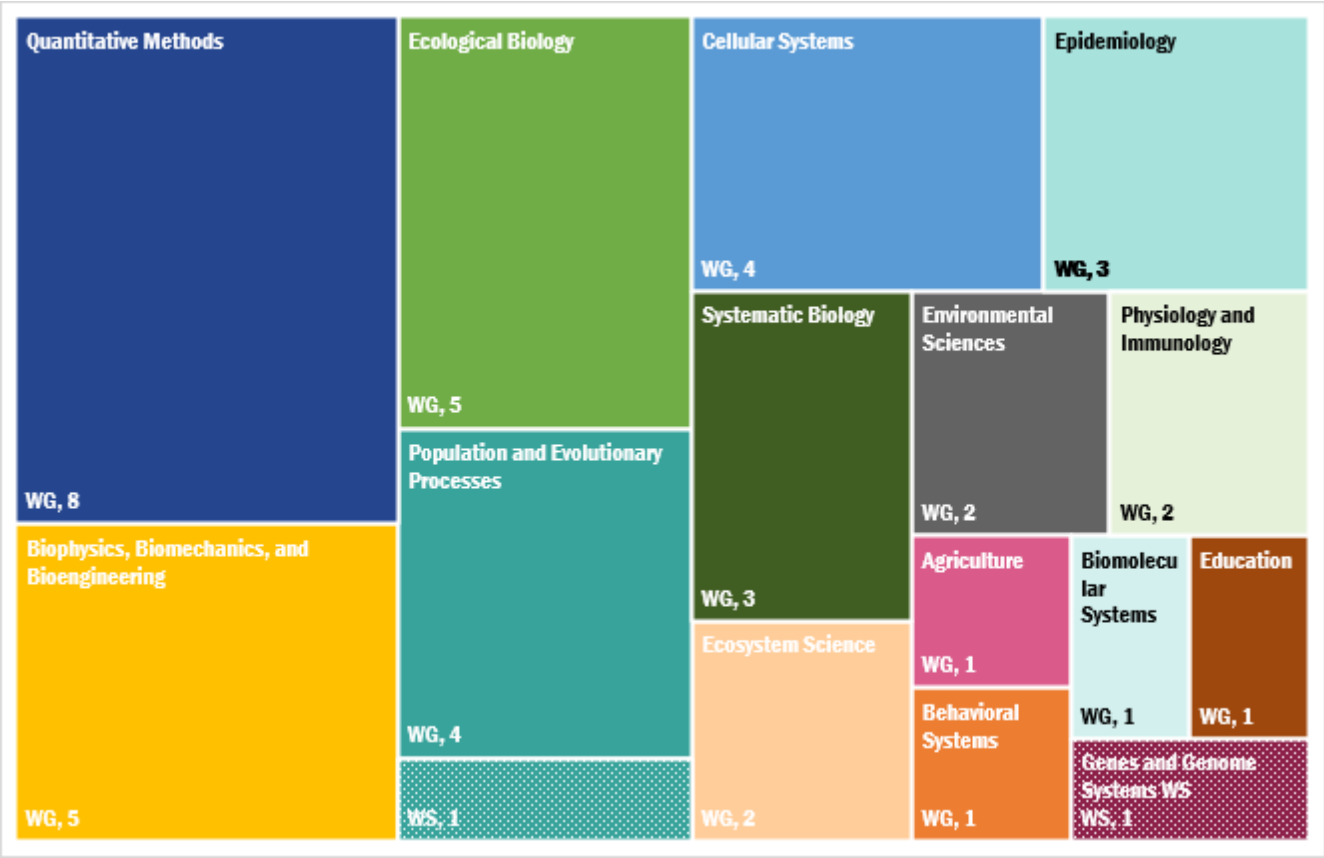


Figure 1. Diversity of subject areas represented in NIMBioS Working Group (WG) meetings and Investigative Workshops (WS) during the period from September 1, 2016 – April 30, 2017.

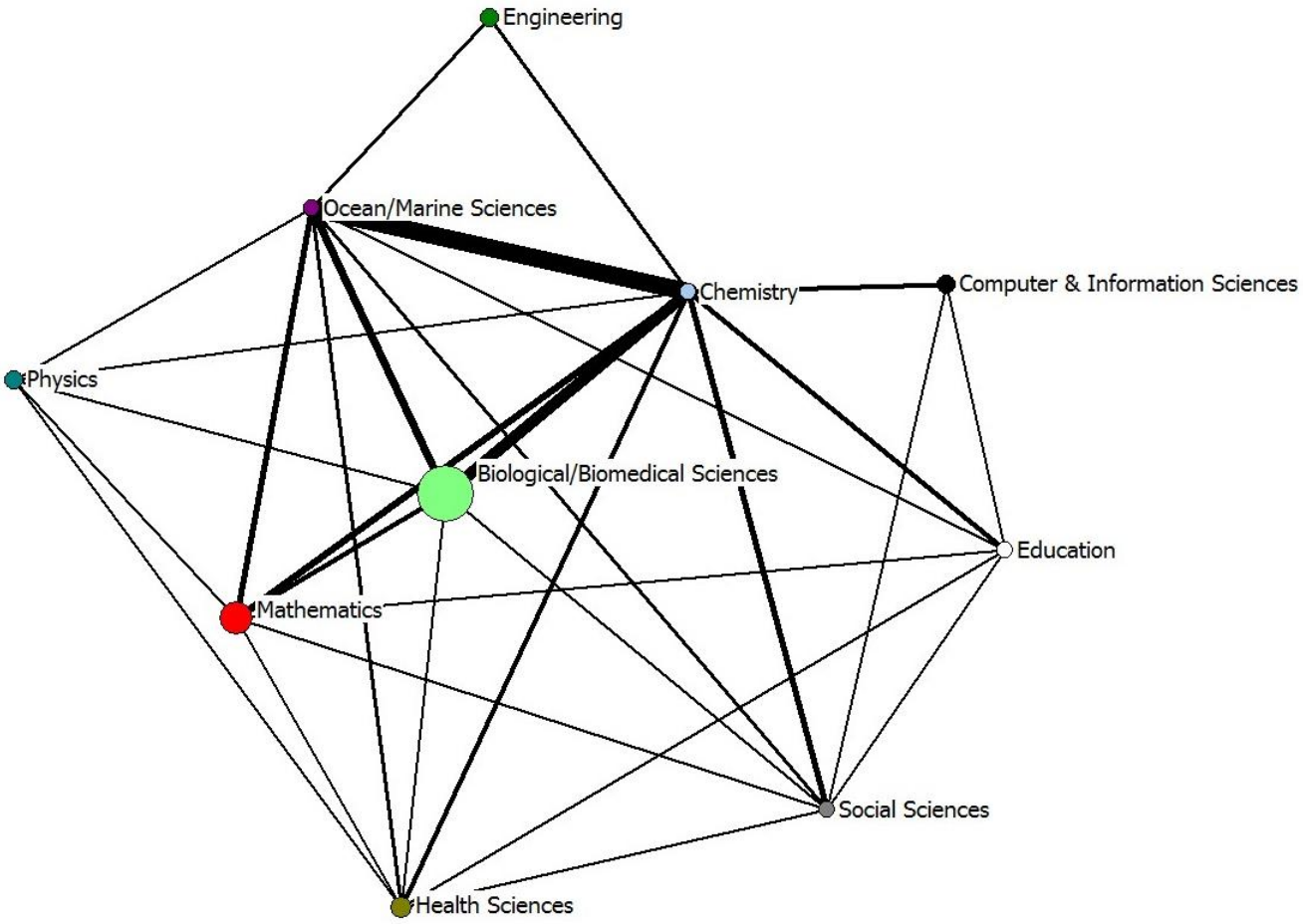


Figure 2. Cross-disciplinary connections fostered among Working Group members through meetings hosted at NIMBioS from September 1, 2016 through April 30, 2017. Node radius is representative of the log-scaled number of participants in each field of study. Line size is representative of the number of times researchers from each field were brought together to collaborate and problem-solve at NIMBioS.

Table 1. Number of NIMBioS articles published in a selection of high-impact journals during the current reporting period (through April 2017) and since NIMBioS' inception, sorted by journal 5-Year Impact Factor

Journal Title	5-Year Impact Factor *	# of NIMBioS Publications in Year 9 **	# of NIMBioS Publications Since Inception ***
Nature	41.46	0	5
Cell	32.86	0	1
Science	34.92	1	8
Trends in Ecology and Evolution	19.42	0	7
Ecology Letters	14.94	1	11
Systematic Biology	15.27	0	7
PLoS Biology	10.73	0	3
Nature Communications	12.00	0	2
Proceedings of the National Academy of Sciences	10.29	3	19
Current Biology	9.73	0	1
PLoS Genetics	7.48	0	2
Nucleic Acids Research	8.65	0	3
Phil Trans of the Royal Soc B-Biological Sciences	7.22	1	7
Molecular Ecology	6.23	1	11
Ecology	5.98	1	7
Proc of the Royal Soc B-Biological Sciences	5.366	2	12
PLoS Computational Biology	5.12	0	8
Evolution	4.37	0	17
Journal of Animal Ecology	5.25	0	4
American Naturalist	4.13	0	13
Journal of the Royal Society Interface	4.41	0	5
PLoS One	3.54	1	36
Animal Behaviour	3.28	0	9
BMC Bioinformatics	3.44	0	2

* 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).

** Number of publications in Year 9 includes all publications reported since compilation of the previous Annual Report (May 2016) through April 2017.

*** September 2008 – April 2017

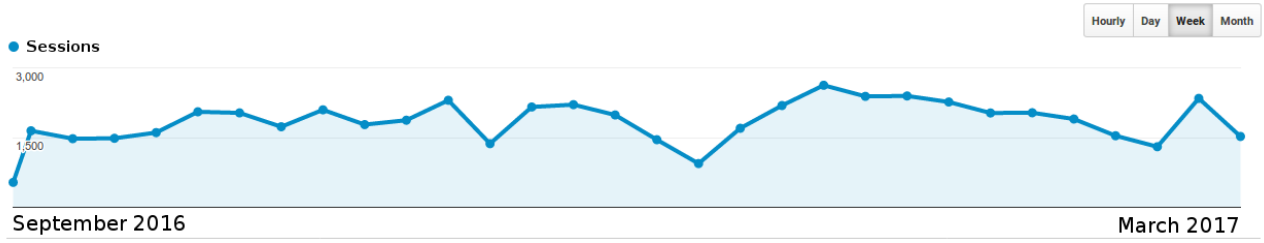
This supporting file contains Table 2 and Figure 3, which show overall trends of *nimbios.org* website visits and unique visitors through the reporting periods (site use data from Google Analytics).

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 - Aug 31, 2013	74123	116473
Sep 1, 2013 - Aug 31, 2014	73906	116331
Sep 1, 2014 - Aug 31, 2015	78604	125992
Sep 1, 2015 – Aug 31, 2016	63800	99723
Sep 1, 2016 - Mar 31, 2017*	34725	56964

*Partial year

(a)



(b)

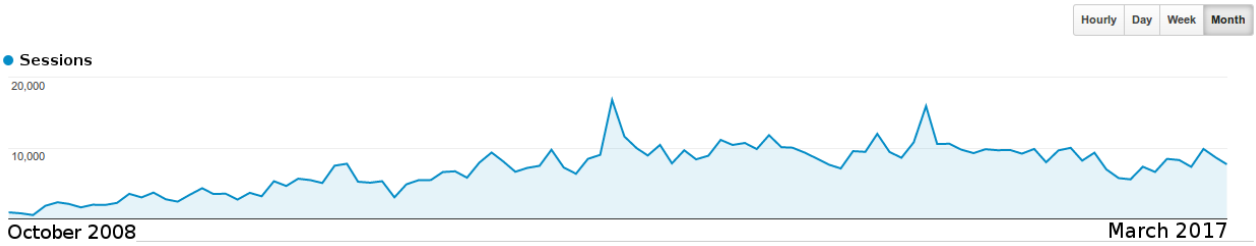


Figure 3. Number of *nimbios.org* website visits for (a) the 2017 reporting year (weekly, September 1, 2016 through March 31, 2017) and (b) monthly for the period October 1, 2008 through March 31, 2017. These figures show the impact of significant products on the number of website visits and document overall trends in visits since the inception of NIMBioS (site use data from Google Analytics).

Products

Books

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Book Chapters

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Inventions

Journals or Juried Conference Papers

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- Zhao et al (2017). Flying Spiders: Simulating and modeling the dynamics of ballooning. *Association for Women in Mathematics Series*. . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Licenses

Other Conference Presentations / Papers

Other Products

- *Software or Netware.*

  Iwasaki WM, Kawata M, Gavrilets S. 2015. Simulation Program: Evolutionary Diversification in Anolis Lizards. https://github.com/heavywatal/edal

- *Software or Netware.*

  Watal M Iwasaki, Masakado Kawata, Sergey Gavrilets. 2016. Modeling the evolutionary diversification of Anolis lizards. https://github.com/heavywatal/edal

- *Educational aids or Curricula.*

  Iselin S, Kugathasan H, Miller J. August 2016. Fossil Finder! Educational Computer Game. http://www.nimbios.org/education/fossil_finder_module

- *Educational aids or Curricula.*

  Kubatko L, Wolfe A, Fuerst P. 2010. Course: EEOB 881: Seminar in Evolution

- *Educational aids or Curricula.*

  Sturner K. 2016. NIMBioS Education Module: 3-D Printing Models of Cell Organelles and Flowers. http://www.nimbios.org/education/3dprinting_module

- *Educational aids or Curricula.*

  Yoshida et al. 2012. Course: University of Kentucky CS 685-001/PPA 784-003/STA 695-001: A graduate course on Phylogenetic Analysis and Molecular Evolution

- *Data and Research Materials (e.g. Cell lines, DNA probes, Animal models).*

  Bapst DW, Wright AM, Matzke NJ, Lloyd GT. 2016. Data from: Topology, divergence dates, and macroevolutionary inferences vary between different tip-dating approaches applied to fossil theropods (Dinosauria). Dryad Digital Repository. https://datadryad.org/resource/doi:10.5061/dryad.n2g80/8

- *Data and Research Materials (e.g. Cell lines, DNA probes, Animal models).*

  Chaudhary et al. 2016. Data from: MycoDB, a global database of plant response to mycorrhizal fungi. Dryad Digital Repository. http://datadryad.org/resource/doi:10.5061/dryad.723m1

- *Data and Research Materials (e.g. Cell lines, DNA probes, Animal models).*

  Matzke NJ, Wright A. 2016. Data from: Inferring node dates from tip dates in fossil Canidae: the importance of tree priors. Dryad Digital Repository (DOI 10.5061/dryad.723m1). http://datadryad.org/resource/doi:10.5061/dryad.vn52f

- *Award.*

  Weitz JS. Winner of the Postgraduate Textbook Prize for book Quantitative Viral Ecology: Dynamics of Viruses and Their Microbial Hosts

- *Conference Paper or Presentation.*

  Gross L. 5 10 2011. NIMBioS: a National Institute fostering research and education at the interface of mathematics and biology. Invited Speaker, DOE Low Dose Radiation Research Investigators' Workshop, Washington, DC.

- *Conference Paper or Presentation.*

  Agusto F. 12 1 2010. Mathematical modeling and optimal control of transmission of avian influenza. Fisk University, Nashville, TN.

- *Conference Paper or Presentation.*

Agusto F. 2 18 2011. Control strategies in malaria transmission models. Interdisciplinary Arts & Sciences, University of Washington, Tacoma.

- *Conference Paper or Presentation.*

  Akcay E. 1 14 2010. Cooperation in animals, plants and bacteria: Why the how is important. Research seminar, UC Riverside.

- *Conference Paper or Presentation.*

  Akcay E. 1 14 2010. Cooperation in animals, plants and bacteria: Why the how is important. Research seminar, UC Riverside.

- *Conference Paper or Presentation.*

  Akcay E. 12 1 2009. NIMBioS: A new national institute to foster mathematical and biological linkages. Cal State Univ, San Marcos.

- *Conference Paper or Presentation.*

  Akcay E. 12 1 2009. The games of nature: New approaches to evolutionary game theory. Cal State Univ, San Marcos.

- *Conference Paper or Presentation.*

  Akcay E. 12 21 2009. Social evolution theory. Istanbul Technical Univ., Istanbul, Turkey.

- *Conference Paper or Presentation.*

  Akcay E. 12 21 2009. The games of nature: New approaches to evolutionary game theory. Istanbul Technical Univ., Istanbul, Turkey.

- *Conference Paper or Presentation.*

  Akcay E. 12 2010. Evolution of cooperation in animals, plants and bacteria: Why the 'how' is important. UC Riverside Dept of Biology, Lunch Seminar.

- *Conference Paper or Presentation.*

  Akcay E. 4 22 2010. The evolution of games and how to play them. Research seminar, UC Berkeley.

- *Conference Paper or Presentation.*

  Akcay E. 4 2011. Research presentation. Research presentation, NC State Univ. Raleigh.

- *Conference Paper or Presentation.*

  Akcay E. 6 2010. Kin selection, behavioral dynamics, and group optimality. Research presentation, Evolution Society Meeting, Portland, OR.

- *Conference Paper or Presentation.*

  Alouani S, Rice H, Day J, Eda S. 4 13 2016. Exploring Granuloma Formation in Johne's Disease. EUReCA, University of Tennessee.

- *Conference Paper or Presentation.*

  Alouani S, Rice H, Day J, Eda S. 4 15 2016. Exploring Granuloma Formation in Johne's Disease. Women STEM, University of Tennessee, Ming Kao Building.

- *Conference Paper or Presentation.*

  An G. 11 2 2010. Agent-based modeling for dynamic knowledge representation of biomedical systems. Engineering Seminar Series, Univ. of Wisconsin, Milwaukee, WA.

- *Conference Paper or Presentation.*

  An G. 7 15 2010. Agent-based dynamic knowledge representation of inflammation: Insights for interventions and control. Invited Speaker, Minisymposium: Inflammation and Complex Immune Interactions: Modeling, Simulation, and Control at the SIAM Conference on Life Sciences, Pittsburgh, PA.

- *Conference Paper or Presentation.*

  Ane C, Knowles L. 11 2011. Using both genes and phenotypes to delimit species. Workshop "Evolutionary Genomics", part of the semester program "Mathematical and Computational Approaches in High-Throughput Genomics", Institute for Pure and Applied Mathematics (IPAM), UCLA.

- *Conference Paper or Presentation.*

  Bewick S, Yang R, Ganusov V. 2010. Growth detection: A novel role for CD4+ T-cells. MBI Workshop for Young Researchers in Mathematical Biology, Columbus, OH.

- *Conference Paper or Presentation.*

  Bishop P. 11 2010. A student-generated collaborative approach to developing new evaluator competencies. Roundtable presentation at the American Evaluation Association Annual Conference, San Antonio, TX.

- *Conference Paper or Presentation.*

Bishop P. 11 2010. My first year as an internal evaluator: What I didn't know that I didn't know. Roundtable presentation at the American Evaluation Association Annual Conference, San Antonio, TX.

- *Conference Paper or Presentation.*

  Bishop P. 2 2011. Using program theory to communicate evaluation plans with stakeholders. Paper presented at Southeastern Evaluation Association Annual Conference, Tallahassee, FL.

- *Conference Paper or Presentation.*

  Caja Rivera RM, Barradas I. 5 2016. To protect female sandflies to protect humans?: Control policies in Cutaneous leishmaniasis. BAMM, Biology and Medicine Through Mathematics Conference, Virginia CommonWealth University, Richmond, VA.

- *Conference Paper or Presentation.*

  Carr E. 2 26 2012. Web-based feral swine management tool for natural resource. Association of American Geographers Annual Meeting, New York, NY.

- *Conference Paper or Presentation.*

  Chen S, Sanderson M, Lanzas C. 11 29 2011. Modeling temporal patterns of Escherichia coli O157 fecal shedding in cattle. Epidemics 3rd International Conference on Infectious Disease Dynamcis, Boston, MA.

- *Conference Paper or Presentation.*

  Cooper A, Reagan K, Horton E. 10 2016. Modeling of Human Emotions. NIMBioS Undergraduate Research Conference at the Interface of Mathematics and Biology, Knoxville, TN.

- *Conference Paper or Presentation.*

  Cooper A. 2016. Dynamic modeling of human emotion. Southeastern Conference for Undergraduate Women in Mathematics, Duke University.

- *Conference Paper or Presentation.*

  Cooper A. 3 2017. Dynamic modeling of human emotion. Posters at the Capitol 2017. Nashville, TN.

- *Conference Paper or Presentation.*

Crawley C. 3 2011. Information science at the interface of mathematics and biology: The example of NIMBIoS. Informational talk. Environmental information science undergraduate course at Univ. of Tennessee, Knoxville.

- *Conference Paper or Presentation.*

  Crawley C. 9 8 2011. Legality and ethics: Research and the legacy of Henrietta Lacks at UTK. Invited Panelist, UT's Life of the Mind Discussion Panel for Freshman, Univ. of Tennessee.

- *Conference Paper or Presentation.*

  Crawley C. 2011. Information science at the interface of mathematics and biology: The example of NIMBIoS. Environmental information science undergraduate course at Univ. of Tennessee, Knoxville.

- *Conference Paper or Presentation.*

  Darville J, Nasir O. 10 2016. Decoding Allostery by Mathematical Analysis of Molecular Dynamics Simulations. NIMBioS Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

- *Conference Paper or Presentation.*

  Day J. 11 2010. Research presentation for the EECS Junior Seminar, University of Tennessee. .

- *Conference Paper or Presentation.*

  Day J. 9 26 2011. Modeling the host response to respiratory pathogens: Mycobacterium Tuberculosis and Bacillus Anthracis. AMS Fall Southeastern Section Meeting, Wake Forest University, Winston-Salem, NC.

- *Conference Paper or Presentation.*

  Day J. 9 2010. Informational talk, Introduction to Scientific Computing undergraduate course, University of Tennessee. .

- *Conference Paper or Presentation.*

  Duncan S. 3 19 2010. NIMBioS informational talk, National Science Teachers Association Annual Meeting. .

- *Conference Paper or Presentation.*

Eda S, Rice JH, Marek A, Alouani SM, Day J. 6 20 2016. In vitro experimental work and agent-based modeling of granuloma formation caused by Mycobacterium avium subsp. paratuberculosis. International Colloquium for Paratuberculosis, Nantes, France.

- *Conference Paper or Presentation.*

  Forbes VE, Galic N, Murphy C, Salice C, Nisbet R. 5 8 2016. Dynamic models to link impacts of chemicals from molecules to ecosystems. International Society for Ecological Modelling Global Conference, Towson, MD.

- *Conference Paper or Presentation.*

  Ganusov V. 4 2010. HIV dynamics and evolution annual meeting. Monterey, CA.

- *Conference Paper or Presentation.*

  Ganusov V. 4 2010. Quantifying factors determining the rate of CTL escape and reversion during acute and chronic phases of HIV infection. International HIV Dynamics & Evolution Conference, Monterey, CA.

- *Conference Paper or Presentation.*

  Ganusov V. 4 2011. Physics of immunity: Complexity approach. Invited talk, Dresden, Germany.

- *Conference Paper or Presentation.*

  Gary A, Liu V, Wu P. 10 2016. Developing a Particle Filtering Algorithm to Track Organelle Movements in Plant Cells. NIMBioS Undergraduate Research Conference at the Interface of Mathematics and Biology, Knoxville, TN.

- *Conference Paper or Presentation.*

  Gavrilets S. 10 23 2009. What's math got to do with it? Connections between math and biology at NIMBioS. Opening talk, NIMBioS Undergraduate Research Conference at the Interface Between Biology and Mathematics.

- *Conference Paper or Presentation.*

  Gavrilets S. 10 27 2009. Multiscale modeling, space and control of natural systems. National Academy Board on Life Sciences, Washington, DC.

- *Conference Paper or Presentation.*

Gavrilets S. 10 28 2009. NIMBioS: Synergies with agricultural sciences. Talk to Directors, National Institutes of Food and Agriculture, USDA, Washington, DC.

- *Conference Paper or Presentation.*

  Gavrilets S. 10 9 2009. Integrating into the future: NIMBIoS and the math/biology interface. Keynote address, Second International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems.

- *Conference Paper or Presentation.*

  Gavrilets S. 10 2009. Cycling in the complexity of early societies. Dept of Anthropology, State Univ. of Washington, Pullman.

- *Conference Paper or Presentation.*

  Gavrilets S. 10 2011. Human origins and the transition from promiscuity to pair-bonding. Shanghai, China.

- *Conference Paper or Presentation.*

  Gavrilets S. 12 2011. Rapid transition towards the division of labor via evolution of developmental plasticity. Tucson, AZ.

- *Conference Paper or Presentation.*

  Gavrilets S. 2 2010. Dynamics of adaptive radiation. Vanderbilt University, Darwin's Day.

- *Conference Paper or Presentation.*

  Gavrilets S. 2 2012. Approaches to modeling the transition from small- to large-scale societies. NIMBioS.

- *Conference Paper or Presentation.*

  Gavrilets S. 2 2012. On the evolutionary origins of human egalitarian syndrome. University of Toulouse, France.

- *Conference Paper or Presentation.*

  Gavrilets S. 3 2010. Dynamics of ecological speciation. Washington Univ., St Louis.

- *Conference Paper or Presentation.*

Gavrilets S. 3 2012. On the evolutionary origins of human egalitarian syndrome. Santa Fe Institute.

- *Conference Paper or Presentation.*

  Gavrilets S. 3 2012. On the evolutionary origins of human egalitarian syndrome. Univ. of Lausanne, Switzerland.

- *Conference Paper or Presentation.*

  Gavrilets S. 3 2012. On the evolutionary origins of human egalitarian syndrome. Univ. of Montpellier, France.

- *Conference Paper or Presentation.*

  Gavrilets S. 6 2011. Modeling the emergence of fungal diseases as ecological speciation. Roscoff, France.

- *Conference Paper or Presentation.*

  Gavrilets S. 7 2011. Coalition formation and the egalitarian revolution. Montpellier, France.

- *Conference Paper or Presentation.*

  Gavrilets S. 8 2011. Rapid transition towards the division of labor via evolution of developmental plasticity. Tubingen, Germany.

- *Conference Paper or Presentation.*

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

- *Conference Paper or Presentation.*

  Godsoe W, Adhikari S. 8 2010. Understanding biodiversity through distance measures and multidimensional plots. Mathfest Pittsburgh, PA.

- *Conference Paper or Presentation.*

  Godsoe W, Harmon LJ. 8 2010. Do unmeasured biotic interactions bias species distribution models?. Ecological Society of America.

- *Conference Paper or Presentation.*

Godsoe W. 1 2011. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Kennesaw State University.

- *Conference Paper or Presentation.*

  Godsoe W. 11 2010. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Duke University.

- *Conference Paper or Presentation.*

  Godsoe W. 11 2010. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. North Carolina State University.

- *Conference Paper or Presentation.*

  Godsoe W. 11 2010. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Universite de Montreal.

- *Conference Paper or Presentation.*

  Godsoe W. 12 2010. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Western Kentucky University.

- *Conference Paper or Presentation.*

  Godsoe W. 2 16 2010. How do we test for coevolution in nature. EEB seminar, North Carolina State Univ.

- *Conference Paper or Presentation.*

  Godsoe W. 2 2011. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Virginia Commonwealth University.

- *Conference Paper or Presentation.*

  Godsoe W. 3 15 2010. I can't define the niche but I know it when I see it. EEB Seminar, Louisiana State University.

- *Conference Paper or Presentation.*

  Godsoe W. 3 2010. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Louisiana State University.

- *Conference Paper or Presentation.*

Godsoe W. 3 2011. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. Howard University.

- *Conference Paper or Presentation.*

  Godsoe W. 6 2010. A statistical justification for using distribution models to infer changes in environmental requirements. Society for the Study of Evolution.

- *Conference Paper or Presentation.*

  Godsoe W. 2011. I can't define the niche but I know it when I see it: Using probability theory to understand species distributions. University of Hawaii at Manoa.

- *Conference Paper or Presentation.*

  Godsoe et al. 11 2010. Biodiversity in the Great Smoky Mountains National Park: Past and present measurements. NIMBioS Undergraduate Research Conference.

- *Conference Paper or Presentation.*

  Godsoe et al. 9 2010. Biodiversity in the Great Smoky Mountains National Park: Past and present measurements. Meeting of the Oklahoma Academy of Sciences.

- *Conference Paper or Presentation.*

  Gonzalez-Forero M, Gavrilets S. 6 21 2011. Evolution of primitive eusociality via maternal manipulation. Evolution 2011: Joint Meeting of the Society for the Study of Evolution, the American Society of Naturalists and the Society of Systematic Biologists, Univ. of Oklahoma.

- *Conference Paper or Presentation.*

  Gonzalez-Forero P. 12 2010. Eusociality through maternal manipulation. Biocomplexity XI: The evolution of cooperation, Indiana University, Bloomington, IN.

- *Conference Paper or Presentation.*

  Gross L, Gavrilets S. 1 17 2012. NIMBioS: Fostering Mathematics Interactions with Life Sciences Research and Human Health. NIH National Institute for General Medical Sciences.

- *Conference Paper or Presentation.*

  Gross L. 1 10 2012. Ecology and big projects: Lessons from everglades restoration planning. Invited speaker, University of California at Los Angeles Dept of Ecology and Evolutionary Biology.

- *Conference Paper or Presentation.*

  Gross L. 1 10 2012. Mathematics and life science education: Promoting interdisciplinarity. Invited speaker, University of California at Los Angeles Dept of Ecology and Evolutionary Biology.

- *Conference Paper or Presentation.*

  Gross L. 1 18 2011. Building quantitative concepts and skills for life science students. Invited speaker and faculty workshop leader, Depts of Math and Biology, University of the Virgin Islands, St. Thomas.

- *Conference Paper or Presentation.*

  Gross L. 1 18 2011. What's math got to do with it? Connections between math and biology. Invited speaker and faculty workshop leader, Depts of Math and Biology, University of the Virgin Islands, St. Thomas.

- *Conference Paper or Presentation.*

  Gross L. 10 27 2011. Space and control in natural systems. University of Vermont Dept of Plant Biology, Burlington, VT.

- *Conference Paper or Presentation.*

  Gross L. 10 2015. Best" in a Biological Context: Optimization across the Biological Hierarchy". Invited Speaker, Seminar Series on Graduate Education for Educators and Mathematics Department Seminar, Middle Tennessee State University, Murfreesboro, TN.

- *Conference Paper or Presentation.*

  Gross L. 10 2015. Quantitative Education for 'Fearless' Biologists: A Curriculum Perspective. Invited Speaker, Seminar Series on Graduate Education for Educators and Mathematics Department Seminar, Middle Tennessee State University, Murfreesboro, TN.

- *Conference Paper or Presentation.*

  Gross L. 11 15 2010. Comments on the mathematics of sustainability science. Opening speaker, steering committee member and panel discussant, Workshop on Mathematical Challenges for Sustainability, Center for Discrete Mathematics and Theoretical Computer Science, Rutgers University, Rutgers, NJ.

- *Conference Paper or Presentation.*

Gross L. 11 5 2010. Space and control in natural systems. Invited speaker, Math Dept Invited Lecturer Series in Math Biology, Duke University, Durham, NC.

- *Conference Paper or Presentation.*

  Gross L. 11 7 2011. Invited Speaker, Workshop on Mathematics and Life Science Education: Promoting Interdisciplinarity. Univ. of Missouri Life Sciences Program, Columbia, Missouri.

- *Conference Paper or Presentation.*

  Gross L. 11 9 2010. Steering committee member and panel moderator, Workshop on the Role of Animal Agriculture in a Sustainable 21st Century Global Food System, Board on Agriculture and Natural Resources, National Academy of Sciences, Washington, DC. .

- *Conference Paper or Presentation.*

  Gross L. 11 2015. Best" in a Biological Context: Optimization across the Biological Hierarchy". Invited Speaker, Science Education Series and Mathematics Department, Oregon State University, Corvallis, OR.

- *Conference Paper or Presentation.*

  Gross L. 11 2015. Quantitative Education for 'Fearless' Biologists: A Curriculum Perspective. Invited Speaker, Science Education Series and Mathematics Department, Oregon State University, Corvallis, OR.

- *Conference Paper or Presentation.*

  Gross L. 12 13 2010. Participant in the Planning Meeting for National Research Council Standing Committee on the Use of Emerging Science for Environmental Health Decisions, Washington, DC. .

- *Conference Paper or Presentation.*

  Gross L. 2 12 2010. Mathematics and life science education: Promoting interdisciplinarity, and space and control in natural systems. Invited talk and workshop, Univ. of Nevada, Las Vegas, UBM Program.

- *Conference Paper or Presentation.*

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

- *Conference Paper or Presentation.*

Gross L. 2 24 2010. What's math got to do with it? Connections between math and biology at NIMBioS. Tennessee Governor's Academy, Knoxville, TN.

- *Conference Paper or Presentation.*

  Gross L. 2 4 2010. Computational thinking, models and data: Comments from thirty years of effort at the math/biology interface. National Academy of Sciences Workshop on Computational Thinking for Everyone, Remote presentation to Workshop in Washington, DC.

- *Conference Paper or Presentation.*

  Gross L. 2 2016. Best" in a Biological Context: Optimization across the Biological Hierarchy". Invited Speaker, Mathematics Department, University of Missouri, Kansas City, MO.

- *Conference Paper or Presentation.*

  Gross L. 3 18 2011. Trees as engineers: Lessons from some mathematical models in plant ecology. Invited speaker, Conference on Computational Systems Biology, University of Florida, Gainesville, FL.

- *Conference Paper or Presentation.*

  Gross L. 3 31 2011. Participant, National Science Board Task Force on Unsolicited Mid-scale Research, Denver, CO. .

- *Conference Paper or Presentation.*

  Gross L. 3 2016. Biology as a Driver for Undergraduate Quantitative Sciences Education. Panel Speaker, Meeting on Transforming Post-Secondary Education in Mathematics, National Academies, Washington, DC.

- *Conference Paper or Presentation.*

  Gross L. 4 10 2010. NIMBioS: Opportunities for graduate students. Informal presentation, UTK Undergraduate Mathematics Conference.

- *Conference Paper or Presentation.*

  Gross L. 4 14 2011. Moderator and panelist, Workshop on Glioma Ecosystem Opportunities, James S. McDonnell Foundation, La Jolla, CA. .

- *Conference Paper or Presentation.*

Gross L. 4 2 2011. NIMBioS: A National Institute fostering Research and Education at the Interface of Mathematics and Biology. Invited Speaker, Oak Ridge Institute for Continued Learning, Oak Ridge, TN.

- *Conference Paper or Presentation.*

  Gross L. 4 22 2010. What's math got to do with it? Connections between math and biology at NIMBioS. UTK Mathematics Department Junior Colloquium.

- *Conference Paper or Presentation.*

  Gross L. 4 2016. "Best" in a Biological Context: Optimization, Space and Control. Invited Speaker, EEB and Mathematics Departments, Cornell University, Ithaca, NY.

- *Conference Paper or Presentation.*

  Gross L. 4 2016. Mathematics Education for Life Science Undergraduates: Lessons from 40 Years of Efforts. Invited Speaker, EEB and Mathematics Departments, Cornell University, Ithaca, NY.

- *Conference Paper or Presentation.*

  Gross L. 5 10 2011. NIMBioS: a National Institute fostering research and education at the interface of mathematics and biology. Invited Speaker, DOE Low Dose Radiation Research Investigators' Workshop, Washington, DC.

- *Conference Paper or Presentation.*

  Gross L. 5 2015. Preparing "Fearless" Biologists: the Quantitative Component of Undergraduate Education. Invited Speaker, American Society for Microbiology Conference for Undergraduate Educators, Austin, TX.

- *Conference Paper or Presentation.*

  Gross L. 5 2016. Best in a Biological Context: Optimization, Space and Control. Plenary Speaker, Midwest Mathematical Biology Conference, University of Wisconsin, La Crosse.

- *Conference Paper or Presentation.*

  Gross L. 6 2015. Whither Undergraduate Quantitative Biology Education?. Invited Speaker and Workshop Organizer, HHMI/BioQuest/ScienceCaseNet Workshop on Count the Ways: Engaging Students in Quantitative Biology Applications. Harvey Mudd College, Claremont, CA.

- *Conference Paper or Presentation.*

Gross L. 6 2016. What's math got to do with it? Connections between math and biology. Invited Speaker, UTK Governor's School on Science and Engineering, Knoxville, TN.

- *Conference Paper or Presentation.*

  Gross L. 7 15 2010. Florida panther recovery: Evidence, models and implications for public policy. Greater Everglades Ecosystem Restoration Meeting, Fort Meyers, FL.

- *Conference Paper or Presentation.*

  Gross L. 7 28 2010. Getting ahead in math bio ed: A national plan for undergraduate quantitative life science education in the US. Invited mini-symposium talk, Society for Mathematical Biology Annual Meeting, Rio de Janeiro, Brazil.

- *Conference Paper or Presentation.*

  Gross L. 7 3 2011. Selective ignorance and multiple scales in biology: Deciding on criteria for model utility. Invited Speaker, Konrad Lorenz Institute Workshop on Meaning of Theory in Biology, Vienna, Austria.

- *Conference Paper or Presentation.*

  Gross L. 7 7 2011. NIMBioS: a national institute fostering research and education at the interface of mathematics and biology. Webinar Speaker, NIH Interagency Modeling and Anlysis Group and Multiscale Modeling Consortium Special Presentation.

- *Conference Paper or Presentation.*

  Gross L. 8 19 2011. NIMBioS and Computational Science: Fostering Research and Education at the Interface of Mathematics and Biology. Invited Speaker, UTK Computational Science Kickoff.

- *Conference Paper or Presentation.*

  Gross L. 8 2 2011. Drugs, Sex and Rock'n-Roll: Biology examples to motivate undergraduate math classes. Mathematical Association of America Mathfest Short Course on Trends in Mathematical Biology, Lexington, KY.

- *Conference Paper or Presentation.*

  Gross L. 8 3 2010. Linking mathematical and computational science with ecology education. Invited organized oral session talk, Ecological Society of America Annual Meeting, Pittsburgh, PA.

- *Conference Paper or Presentation.*

Gross L. 9 1 2010. Invited panelist and moderator, Evolutionary Dynamics in Cancer, sponsored by James S. McDonnell Foundation, Almagro, Spain. .

- *Conference Paper or Presentation.*

  Gross L. 9 18 2011. NIMBioS: A national institute fostering research and education at the interface of mathematics and biology. Participant and speaker, NSF Workshop on Adaptive Organismal Biology, Washington, DC.

- *Conference Paper or Presentation.*

  Gross L. 9 27 2010. Space and control in natural systems and interdisciplinary education at the mat/biology interface. Invited talk and faculty workshop, Departments of Math and Biology, James Madison University, Harrisonburg, VA.

- *Conference Paper or Presentation.*

  Gross L. 9 2010. Math, computing, undergraduate ecology and large datasets. Ecological Society of America Ecology and Education Summit.

- *Conference Paper or Presentation.*

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

- *Conference Paper or Presentation.*

  Gross L. 2015. Quantitative Education for 'Fearless' Biologists: A Curriculum Perspective. Invited Speaker, Gordon Research Conference on Undergraduate Biology Education Research, Bates College, Maine.

- *Conference Paper or Presentation.*

  Gross L. 2016. WhatΓÇÖs math got to do with it? Connections between math and biology. Invited Speaker, UTK Governor's School on Science and Engineering, Knoxville, TN.

- *Conference Paper or Presentation.*

  Hamelin FM. 11 5 2016. The evolution of plant virus transmission pathways. Models in Population Dynamics and Ecology, Marseille, France.

- *Conference Paper or Presentation.*

Hamelin FM. 5 30 2016. The evolution of plant virus transmission pathways. Emerging Trends in Applied Mathematics and Mechanics, Perpignan, France.

- *Conference Paper or Presentation.*

  Hickling G. 10 2009. The ecology of tick-borne disease in Tennessee. Epi-Group presentation, University of Tennessee Institute of Agriculture, Knoxville, TN.

- *Conference Paper or Presentation.*

  Hickling G. 3 2010. Blacklegged tick phenology and behavior: Implications for Lyme disease in southern states. Ecology and Evolution of Infectious Disease PI Meeting, Atlantic City, NJ.

- *Conference Paper or Presentation.*

  Hickling G. 8 2009. Persistence and spread of the agent of Lyme disease in low-density, emerging blacklegged tick populations. CODIGEOSIM Workshop on Geosimulation and Mathematical Modeling for Zoonotic Disease, York University, Toronto.

- *Conference Paper or Presentation.*

  Igoe M, Sheets T. 10 2016. A Discrete Age Structured Model of Hantavirus Among Rodents in Paraguay. NIMBioS Undergraduate Research Conference at the Interface of Biology and Mathematics, Knoxville, TN.

- *Conference Paper or Presentation.*

  Ingersoll T. 11 19 2011. Sampling problems and white-nose syndrome: The importance of good science. Presented to the WNS for Cavers Workshop, Fall Creek Falls, TN.

- *Conference Paper or Presentation.*

  Kaplan M. 4 2014. The role of direct and indirect transmission routes and mouse heterogeneity in Hantavirus spread. Tulane University School of Science and Engineering Research Day.

- *Conference Paper or Presentation.*

  Kugathasan H. 10 2016. Developing Video Games for Inquiry-Based Elementary and Middle School Mathematics and Biology Education. NIMBioS Undergraduate Research Conference at the Interface of Mathematics and Biology, Knoxville, TN.

- *Conference Paper or Presentation.*

Lacasse K. 1 2017. Does psychology matter? Integrating human risk perception and behavior into a climate model. Sustainability Psychology Preconference of the Society for Personality and Social Psychology Convention, San Antonio, TX.

- *Conference Paper or Presentation.*

  Lam AR, Matzke NJ, Stigall AL. 7 2016. Testing Dispersal of Benthic Invertebrates during the Richmondian Invasion using Bayesian and Maximum-Likelihood Analyses. IGCP 591 The Early to Middle Palaeozoic Revolution, University of Ghent, Ghent, Belgium.

- *Conference Paper or Presentation.*

  Langston M. 12 2009. Parametrized algorithms for string correction problems. Invited talk, International Workshop on Parameterized Complexity and Approximation Algorithms, Schloss Dagstuhl, Germany.

- *Conference Paper or Presentation.*

  Langston M. 3 2010. Graph algorithms for machine learning: A case-control study based on prostate cancer populations and high throughput transcriptomic data. Research presentations at UT-ORNL-KBRIN Bioinformatics Summit, Cadiz, KY.

- *Conference Paper or Presentation.*

  Langston M. 3 2010. Inferring gene coexpression networks for low dose ionizing radiation using graph theoretical algorithms and systems genetics. Research presentations at UT-ORNL-KBRIN Bioinformatics Summit, Cadiz, KY.

- *Conference Paper or Presentation.*

  Langston M. 3 2010. Scalable high performance algorithms and implementations, with applications to the analysis of high-throughput biological data. Invited talk at Institute of Biological Engineering Annual Conference, Cambridge, MA.

- *Conference Paper or Presentation.*

  Langston M. 3 2010. Serendipitous discoveries in microarray analysis. Research presentations at UT-ORNL-KBRIN Bioinformatics Summit, Cadiz, KY.

- *Conference Paper or Presentation.*

  Langston M. 7 2009. Scalable computational methods for the analysis of high-throughput biological data. Invited talk at DOE EPSCoR Program Review Workshop, Brookhaven National Laboratory, Upton, NY.

- *Conference Paper or Presentation.*

  Lanzas C. 11 22 2011. Modeling antimicrobial resistance in animal populations. 2011 Meeting of the Dutch Society for Veterinary Epidemiology and Economics, Utrecht, Netherlands.

- *Conference Paper or Presentation.*

  Ledder G. 7 2016. A simple resource allocation model for plants. European Conference on Mathematical and Theoretical Biology, Nottingham.

- *Conference Paper or Presentation.*

  Lenhart S. 1 13 2010. NIMBioS informational talk at MAA session on enrichment activities for math majors, Joint Math Meetings, San Francisco. .

- *Conference Paper or Presentation.*

  Lenhart S. 1 4 2012. Tres and soil microbes: Activities for bringing life (science) to mathematics. Joint Mathematics Meetings, Boston, MA.

- *Conference Paper or Presentation.*

  Lenhart S. 1 2010. Informational talk at the Joint Math Meetings, New Orleans, LA. .

- *Conference Paper or Presentation.*

  Lenhart S. 11 2010. Informational talk at California State University San Marcos. .

- *Conference Paper or Presentation.*

  Lenhart S. 2 11 2010. The power of optimal control: From controlling rabies to CPR. Invited seminar, Fisk University.

- *Conference Paper or Presentation.*

  Lenhart S. 2 2010. Introductory talk at Duke University. .

- *Conference Paper or Presentation.*

  Lenhart S. 3 2 2010. Optimal control of harvesting models. Invited seminar, Univ. of Kentucky.

- *Conference Paper or Presentation.*

Lenhart S. 7 21 2009. The power of optimal control. Invited talk at Mu Alpha Theta National Convention, Knoxville, TN.

- *Conference Paper or Presentation.*

  Lenhart S. 7 27 2009. NIMBioS informational talk at Society of Mathematical Biology Meeting, Vancouver, Canada. .

- *Conference Paper or Presentation.*

  Lenhart S. 7 2010. Informational talks, Society of Industrial and Applied Mathematics annual meeting. .

- *Conference Paper or Presentation.*

  Lenhart S. 8 25 2009. Optimal control of two models of rabies in raccoons. Invited plenary talk, Young Investigators Workshop, Mathematical Biosciences Institute.

- *Conference Paper or Presentation.*

  Lenhart S. 8 2010. Informational talk at James Mason University. .

- *Conference Paper or Presentation.*

  Lenhart S. 9 10 2009. The power of optimal control. Invited community colloquium, York University, Toronto, Canada.

- *Conference Paper or Presentation.*

  Lenhart S. 9 17 2009. The power of applied math. Invited distinguished lecture, Middle Tennessee State University.

- *Conference Paper or Presentation.*

  Lenhart S. 9 17 2009. The power of applied math. Middle Tennessee State University.

- *Conference Paper or Presentation.*

  Lenhart S. 9 2010. Informational talks at the SACNAS annual meeting, Anaheim, CA. .

- *Conference Paper or Presentation.*

  Lika D. 8 29 2016. Combining Modeling and Experimental Approaches for Marine organisms under Stress. MEMS Summer School, Brest, France.

- *Conference Paper or Presentation.*

  Loyd KT, DeVore JL. 8 2010. Feral cat population dynamics and prey take under varying management strategies: A stochastic, demographically-structured modeling approach. The Georgia Chapter of The Wildlife Society Fall Meeting, Forsythe, Georgia.

- *Conference Paper or Presentation.*

  Luo Y. 5 16 2016. Evaluation and Improvement of Land Carbon Cycle Models: Theory and Techniques. International Land Model Benchmarking (ILAMB) Workshop, Washington, DC, USA.

- *Conference Paper or Presentation.*

  Luo Y. 6 14 2016. Third dimension of terrestrial carbon cycle. Northwestern Agricultural and Forest University, Yanglin, China.

- *Conference Paper or Presentation.*

  Luo Y. 6 24 2016. Third dimension of terrestrial carbon cycle. Department of Ecology, Eastern China Normal Universtiy.

- *Conference Paper or Presentation.*

  Luo Y. 6 28 2016. Evaluation and Improvement of Land Carbon Cycle Models: Theory and Techniques. Workshop Earth system model coupling, Beijing, China.

- *Conference Paper or Presentation.*

  Luo Y. 7 31 2016. Third dimension of terrestrial carbon cycle. Distinguished Lecture for the Biogeosciences (BG) Section at the 13th Annual Meeting of the Asia Oceania Geosciences Society, Beijing.

- *Conference Paper or Presentation.*

  Manore C. 3 2016. The role of direct and indirect transmission routes and mouse heterogeneity in Hantavirus spread. Careers and Curiosity in Math and Science event, E. J. Martinez Elementary School (minority serving school) in Santa Fe, NM.

- *Conference Paper or Presentation.*

  Mao Y. 3 2011. The games organisms play: How proximate mechanisms can facilitate the evolution of cooperation. Math biology seminar, Dept. of Mathematics, Georgia Institute of Technology.

- *Conference Paper or Presentation.*

Mao Y. 7 20 2010. Research seminar, NESCent, Duke University. .

- *Conference Paper or Presentation.*

  Mao Y. 8 2010. Formal talk, Biocomplexity Institute, Indiana University. .

- *Conference Paper or Presentation.*

  Maroulas V. 2 2016. Tracking Intracellular movements. MBI.

- *Conference Paper or Presentation.*

  Moran E, Kubiske M. 7 2011. Selective impacts of CO2 and ozone on aspen (Populus tremuloides). Botanical Society of America, St. Louis, MO.

- *Conference Paper or Presentation.*

  Moran E. 11 2011. Interactions between ecology and evolution in an changing world. Princeton University.

- *Conference Paper or Presentation.*

  Moran E. 12 2010. Community genetics and global change: Effects of tree genotype and atmospheric pollutants on population and community dynamics. Research presentation, Oak Ridge National Laboratory.

- *Conference Paper or Presentation.*

  Moran E. 4 2011. Hierarchical Bayesian modeling and ecology: Two global-change case studies. Research presentation, Fisk Univ.

- *Conference Paper or Presentation.*

  Moran EV, Kubiske M. 8 2011. Selective impacts of CO2 and ozone on a forest tree. Ecological Society of America, Austin, TX.

- *Conference Paper or Presentation.*

  Munoz-Zanzi C. 4 2016. The unrecognized global burden of leptospirosis; advances and challenges in diagnosis and control. Pediatric Grand Rounds, Medical School, University of Minnesota, Minneapolis, MN.

- *Conference Paper or Presentation.*

Ngonghala C. 1 4 2012. Health safety nets can break cycles of poverty and disease: A stochastic ecological model. AMS Session on Mathematical Biology and Related Fields I, Joint Mathematics Meetings, Boston, MA.

- *Conference Paper or Presentation.*

  Ngonghala C. 1 6 2012. Extreme multi-stability in a chemical model system. MAA General Contribution Paper Session: Research in Applied Mathematics I, Joint Mathematics Meetings, Boston, MA.

- *Conference Paper or Presentation.*

  Ngonghala C. 1 7 2012. Hopf and backward bifurcations in a new model for the dynamics of malaria transmission. AMS Special Session on Control of Biological and Physical Systems II, Joint Mathematics Meetings, Boston, MA.

- *Conference Paper or Presentation.*

  Ngonghala C. 11 14 2011. Extreme multistability in a chemical model. Differential Equations Seminar, Dept of Mathematics, Univ. of Tennessee, Knoxville, TN.

- *Conference Paper or Presentation.*

  Ngonghala C. 11 19 2011. Backward bifurcation and periodic oscillations in a model for the dynamics of malaria transmission. Topics in Mathematical Biology, NIMBioS.

- *Conference Paper or Presentation.*

  Ngonghala C. 11 22 2011. Modeling antimicrobial resistance in animal populations. Meeting of the Dutch Society for Veterinary Epidemiology and Economics, Utrecht, Netherlands.

- *Conference Paper or Presentation.*

  Ngonghala C. 11 3 2011. Should the government provide populations that are trapped in cycles of disease and poverty (poverty traps) income or health care to enable them to escape from such traps?. NIMBioS Outreach Talk, Fisk University, Nashville, TN.

- *Conference Paper or Presentation.*

  Ngonghala C. 2 10 2012. The role of mosquito demography and nourishment habits in the dynamics of malaria transmission. NIMBioS Outreach Talk, Howard University, Washington, DC.

- *Conference Paper or Presentation.*

Ngonghala C. 2 17 2012. Malaria Modeling. Invited lecturer, College of Veterinary Medicine, Univ of Tennessee, Knoxville, TN.

- *Conference Paper or Presentation.*

  Ngonghala C. 8 31 2011. A new route to periodic oscillations in the dynamics of malaria transmission. Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute, The Ohio State University, Columbus, OH.

- *Conference Paper or Presentation.*

  Parkman V. 2016. Canine distemper modeling. Southeastern Conference for Undergraduate Women in Mathematics, Duke University.

- *Conference Paper or Presentation.*

  Peterson C. 10 14 2009. NIMBioS Presentation to SACNAS Board. .

- *Conference Paper or Presentation.*

  Peterson C. 11 13 2009. Structural studies on a pair of circulatory proteins: Cofactors or cohorts in crime?. Seminar at the Univ. of Vermont.

- *Conference Paper or Presentation.*

  Peterson C. 11 20 2009. A pair of circulatory proteins: Cofactors or cohorts in crime. Seminar at Maryville College, Maryville, TN.

- *Conference Paper or Presentation.*

  Peterson C. 12 16 2009. An unexpected role for metals in regulating the activity of a serine protease inhibitor, PAI-1. Research Presentation at Georgia State Univ.

- *Conference Paper or Presentation.*

  Peterson C. 2 4 2010. New insights for an old couple: Regulation of a protease and its inhibitor. Outreach and research presentations at Middle Tennessee State Univ.

- *Conference Paper or Presentation.*

  Peterson C. 2 4 2010. Opportunities for WISE women at the University of Tennessee. Outreach and research presentations at Middle Tennessee State Univ.

- *Conference Paper or Presentation.*

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

- *Conference Paper or Presentation.*

  Peterson C. 7 30 2009. NIMBioS informational talk at ORNL Brown Bag lunch for summer student researchers. .

- *Conference Paper or Presentation.*

  Rua MA, Hoesema JD. 2016. Exploring the relative importance of biotic and abiotic sources of selection for pine-fungal interactions. Yosemite Symbiosis Workshop, Wawona, CA.

- *Conference Paper or Presentation.*

  Ryan D. 10 11 2011. Nonrandom dispersal in intraguild predation communities. NIMBioS Seminar Series, Univ. of Tennessee, Knoxville, TN.

- *Conference Paper or Presentation.*

  Sample C, Bieri J. 2016. Mathematical Models for Habitat Contributions of Migrating Species on a Network. World Conference on Natural Resource Modeling, Flagstaff, AZ.

- *Conference Paper or Presentation.*

  Schugart R. 2 9 2016. Connecting local and global sensitivities in a mathematical model for wound healing. Biomath Seminar. North Carolina State University.

- *Conference Paper or Presentation.*

  Schugart R. 3 12 2016. Connecting local and global sensitivities in a mathematical model for wound healing. 40th Annual SIAM Southeastern Atlantic Section Conference. Athens, GA.

- *Conference Paper or Presentation.*

  Schugart R. 3 3 2016. Differential-equation modeling in wound healing. Differential Equations Seminar. The University of Tennessee, Knoxville.

- *Conference Paper or Presentation.*

Schugart R. 7 14 2016. Using optimal control theory to analyze the treatment of a bacterial infection in a wound with oxygen therapy. 2016 Life Sciences Meeting, Boston, MA.

- *Conference Paper or Presentation.*

  Schugart R. 7 2 2016. Using optimal control theory to analyze the treatment of a bacterial infection in a wound using oxygen therapy. 9th International Conference on Dynamical Systems, Differential Equations, and Applications. Orlando, FL.

- *Conference Paper or Presentation.*

  Schugart R. 7 2 2016. Using optimal control theory to analyze the treatment of a bacterial infection in a wound using oxygen therapy. 9th International Conference on Dynamical Systems, Differential Equations, and Applications. Orlando, FL.

- *Conference Paper or Presentation.*

  Schultheis EH, Kjelvik MK. 2016. Data Nuggets: Bringing authentic research and data in the classroom to unearth studentsΓÇÖ quantitative and inquiry skills. Lowering the Barrier: Making Quantitative Biology More Accessible. National Academies/HHMI Summer Institute on Quantitative Biology (talk).

- *Conference Paper or Presentation.*

  Smaldino PE. 10 2015. Adoption as a social marker: Diffusion of products in a multigroup environment. Conference on Complex Systems, Arizona State University.

- *Conference Paper or Presentation.*

  Sturner K, Lenhart S. 1 4 2012. Trees and soil microbes: Activities for bringing life (science) to mathematics. Joint Mathematics Meetings, Boston, MA.

- *Conference Paper or Presentation.*

  Sturner K, Stanley SG, DeWein K. 11 10 2011. STEM in a box. Tennessee Science Teachers Association, Murfreesboro, TN.

- *Conference Paper or Presentation.*

  Sturner K. 10 12 2011. Biology by numbers from biology in a box. National Association of Biology Teachers Conference, Anaheim, CA.

- *Conference Paper or Presentation.*

Sturner K. 12 2016. Design and 3D Print Cell Organelle and Flower Models!. Tennessee Science Teacher's Association Annual Professional Development Conference, Murfreesboro, TN.

- *Conference Paper or Presentation.*

  Sullivan A, Gilchrist M, Zhao X. 10 2011. Poster presentation: Modeling within-host invasion dynamics of Toxoplasma gondii. ICMA III, Trinity University, San Antonio, TX.

- *Conference Paper or Presentation.*

  Tarasov S. 2016. Integrative phylogeny of dung beetles (Coleoptera: Scarabaeinae). XXV International Congress of Entomology, Orlando, FL.

- *Conference Paper or Presentation.*

  Wadhwa A, Li S, Yang K, Liu X, Bannatine J, Eda S, Wu J. 2 2012. Development of a lab-on-a-chip immunoassay for diagnosis of Johne's Disease. International Association for Paratuberculosis.

- *Conference Paper or Presentation.*

  Welsh C. 2 22 2010. NIMBioS informational welcome to Forest Insects Working Group. .

- *Conference Paper or Presentation.*

  Zhao X, Sullivan A. 8 7 2011. Electronic poster presentation: Agent-based modeling of Toxoplasma. XSEDE HPC Summer School, Lake Tahoe, CA.

- *Conference Paper or Presentation.*

  Zhao X, Sullivan A. 8 7 2011. Electronic poster presentation: Agent-based modeling of Toxoplasma. XSEDE HPC Summer School, Lake Tahoe, CA.

- *Grant Proposal.*

  Allen LJS, Jonsson C. Modeling Immune Dynamics in Persistent Infections of RNA Viruses. NSF Program Mathematical Biology. Submitted.

- *Grant Proposal.*

  Bausch D, Peterson T, et al. Landscape Changes and Evolving Risk of Rodent-Borne Diseases Associated with Construction of a Peruvian Transoceanic Highway: Ecology of Infectious Diseases. Submitted.

- *Grant Proposal.*

  Gavrilets S. 2016. High-performance computing in agent-based modeling of between-group conflicts. DOD. Submitted. $203000.

- *Grant Proposal.*

  Gavrilets, McCullough, Mironova. 2016. Normative influences in intergroup conflicts: integrating insights from social sciences, biology, and modeling. DOD. Submitted. $3200000.

- *Grant Proposal.*

  Grafton ST, Strick PS, Graybiel A, Daw N, Bassett DB. 2016. Neural Foundations of Expertise Based on Optimal Decision-making, Physical Control and Responses to Stress. Army Research Office (Multi-University Research Investigation). Funded. $1200000.

- *Grant Proposal.*

  Han BA, O'Regan SM, Drake JM. 2017. Global Patterns, Predictors And Their Dynamical Consequences in Zoonotic Diseases of Mammals. National Science Foundation, Ecology and Evolution of Infectious Disease Program. Submitted. $2000000.

- *Grant Proposal.*

  Ivanek R, Wiedmann M, Allende A, Suslow T, Munther D. 2016. FSMA agricultural-water die-off compliance provisions benefit from condition-specific modifiers. The Center for Produce Safety. Accepted pre-proposal and invited full proposal. $389,313.

- *Grant Proposal.*

  Shaw AK, Borer E, Seabloom E. 2016. Vector movement and disease risk: When do we need to explicitly account for vector behavior and spatial patterns in disease risk. NSF IOS 1556674. Funded. 443000.

- *Grant Proposal.*

  Snyder WE, Crowder DW et al. 2015. MAP-PSILDS-PNW: Mapping and predicting psyllid sources, immigration and locality-specific disease spread in the PNW. USDA Specialty Crop Research Initiative. Funded. $2688111.

- *Grant Proposal.*

  Strand et al. 2017. Why some trees migrate faster than others: Rates, traits and phylogenetic constraints. NSF. Sumbitted. $2000000.

- *Grant Proposal.*

  Vulinec K, Balke V. 2011. Bats and White-Nose Syndrome on the Delmarva Peninsula: Scanning Electron Microscopy and Disease Proliferation. Delaware State University EPSCoR-CIBER Seed Grants. Funded. $30000.

- *Grant Proposal.*

  Waller S. 2016. Cooperative Predator Vocalization Consortium: Wolves in Yellowstone, NSF REU. Pending.

- *Grant Proposal.*

  Wychty, Gavrilets, Johnson, Restrepo, Spagat. 2016. Many shades of red: complex dynamics of multi-faction conflict and cooperation. DOD. Submitted. $4500000.

- *Grant Proposal.*

  Zhao X, Lenhart S. A modeling and control framework for complex life cycle of Toxoplasma gondii. NIH, NSF, ARO. Submitted.

- *Grant Proposal.*

  Zhao X, Su C. Dynamics of stage conversion in Toxoplasma gondii. NSF. Submitted.

- *Meeting Workshop or Symposium.*

  Akcay E. 11 2010. Evolution of motivations and behavioral responses: Integrating the proximate and ultimate causes of behavior. Symposium on Game Theory and Evolution, University of Paris VI.

- *Meeting Workshop or Symposium.*

  An G. 9 10 2010. Characterization of fundamental aspects of biology with abstract mathematics: Category theory as a pathway for a theory-based approach to biological systems. 9th International Conference on Complexity in Acute Illness, Atlanta, GA.

- *Meeting Workshop or Symposium.*

  Bolnick D. 2011. The ecological consequences of individual variation. Symposium, Ecological Society of America.

- *Meeting Workshop or Symposium.*

  Christley S, An G. 4 9 2011. The computational modeling assistant: Facilitating dynamic hypothesis instantiation through the use of biomedical and modeling & simulation

ontologies. Huggins Research Symposium of the Univ. of Chicago Dept of Surgery, Chicago, IL.

- *Meeting Workshop or Symposium.*

  Cooper A, Horton E, Reagan K. 2016. Dynamic modeling of human emotion. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Dantzler A, Hujoel M, Parkman V. 7 2015. Canine Distemper Outbreak Modeled in an Animal Shelter. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Darville J, Gonzales E, Siess J. 2016. Decoding allostery by mathematical analysis of molecular dynamics simulations. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  DeSalu J, Igoe M, Moran J, Sheets T. 2016. A discrete age structured model of hantavirus among rodents in paraguay. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Gary A, Liu V, Wu P. 2016. Developing a particle filtering algorithm to track organelle movement in plant cells. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Gross L. 12 17 2011. Beer, drugs and rock 'n-roll: Biology examples to motivate undergraduate math classes. Plenary Speaker, 4th International Symposium on Biomathematics and Ecology: Education and Research, Portland, OR.

- *Meeting Workshop or Symposium.*

  Gross L. 2 21 2011. Multi-scale modeling of ecological systems: Systems biology in application to natural resource management. Invited speaker, Symposium on Systems Biology: Definitions and Implementations, Vanderbilt University, Nashville, TN.

- *Meeting Workshop or Symposium.*

Gross L. 2015. Workshop: Integrating quantitative reasoning in biology education: Making the science more authentic and the learning more robust. Workshop Leader, American Society for Microbiology Conference for Undergraduate Educators, Austin, TX.

- *Meeting Workshop or Symposium.*

  Gross L. 3 26 2011. Living in an interdisciplinary world: Coping skills to be successful. Keynote talk, University of Tennessee Undergraduate Honor's Symposium, Knoxville, TN.

- *Meeting Workshop or Symposium.*

  Gross L. 5 22 2010. Getting ahead in math bio ed: Toward a national plan for undergraduate quantitative life science education. Invited talk, Beyond Bio2010 Symposium, Washington, DC.

- *Meeting Workshop or Symposium.*

  Gross L. 6 21 2011. Interdisciplinary Modeling Approaches to Public Health: Examples from NIMBioS. Invited Keynote Speaker, Univ. of TN Comparative and Experimental Medicine/Public Health Research Symposium.

- *Meeting Workshop or Symposium.*

  Gross L. February 2010. Introduction to 'Moving Across Scales: Mathematics for Investigating Biological Hierarchies' Symposium. Organizer and Moderator, American Association for the Advancement of Science Annual Meeting, San Diego, CA.

- *Meeting Workshop or Symposium.*

  Ingersoll T. 10 29 2011. Winter bat count trajectories in regions affected by white-nose syndrome. Presented to the North American Symposium for Bat Research, Toronto, Canada.

- *Meeting Workshop or Symposium.*

  Ingersoll T. 5 18 2011. Inference form white-nose syndrome surveillance data. National White-Nose Syndrome Symposium, Little Rock, AK.

- *Meeting Workshop or Symposium.*

  Iselin S, Kugathasan H, Miller J. 2016. Developing video games for inquiry-based mathematics and biology education. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Jeger MJ. 6 6 2016. The evolution of plant virus transmission pathways. 13th International Plant Virus Epidemiology Symposium, Avignon, France.

- *Meeting Workshop or Symposium.*

  Kjelvik M. 2016. Lowering the Barrier: Making Quantitative Biology More Accessible. National Academies/HHMI Summer Institute on Quantitative Biology.

- *Meeting Workshop or Symposium.*

  Kobayashi I. 22 September 2011. Workshop 16: Impact on genetics from genome microbiology. The 83rd Annual Meeting of the Genetics Society of Japan, Kyoto, Japan.

- *Meeting Workshop or Symposium.*

  Kobayashi I. 27 July 2011. Symposium 5: Genome evolution: surprises from microbes. Annual Meeting of the Society for Molecular Biology and Evolution, Kyoto, Japan.

- *Meeting Workshop or Symposium.*

  Kobayashi I. 27 March 2012. Workshop 4: Surprises from comparison of closely-related multiple genomes. The 85th Annual Meeting of Japanese Society for Bacteriology, Nagasaki, Japan.

- *Meeting Workshop or Symposium.*

  Lenhart S, Schugart R. July 2017. Minisymposium on Modeling and Control in Biological Systems, 2016 SIAM Life Sciences Conference, Boston, MA.

- *Meeting Workshop or Symposium.*

  Lin Y, Bedell M, Roman-Melendez E. 2015. Modeling the Distribution of Fluid Pressure in the Kidney. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Mummah R, Sashidar D, Wei J. 7 2015. Discriminating between Alternative Mechanisms of Formation of Mycobacterial Granulomas in vitro. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

Rice et al. 5 23 2016. Exploring granuloma formation in JohneΓÇÖs disease with in vitro and in silico modeling. UT Comparative & Experimental Medicine Research Symposium.

- *Meeting Workshop or Symposium.*

  Rohly M, Johnson T, Khanal J. 7 2015. Exploring Host-Pathogen Interactions with Agent-Based Models in Netlogo. The University of Tennessee Summer STEM Poster Symposium.

- *Meeting Workshop or Symposium.*

  Torget A, Gurza Lavalle G. 2016. International Symposium on Violence in the U.S.-Mexican Borderlands. William P. Clements Center for Southwest Studies. Southern Methodist University. Dallas, TX.

- *Meeting Workshop or Symposium.*

  Wikle N, Yan R, Gauli A. 7 2015. Projecting Domestic Species Invasion Spread Using Commodity Flow Pathways. The University of Tennessee Summer STEM Poster Symposium.

- *Presentation.*

  Finke et al. 2017 February. Interspecific interactions and the dynamics of vector-borne pathogen spread. Gordon Research Conference on Plant-Herbivore Interactions, Ventura, CA.

- *Presentation.*

  Li et al. 2016 June. Modeling Differential Transmission Mechanisms in Vector-borne Viral Cassava Diseases in Africa. International Plant Virus Epidemiology Workshop in Avignon, France.

- *Presentation.*

  Shaw AK, Peace A, Power AG, Bosque-Perez NA. 2016 June. Circulating Tumor Cells: When a Solid Tumor Meets a Fluid Microenvironment. Ecology and Evolution of Infectious Disease, Cornell, NY.

- *Presentation.*

  Shaw AK, Peace A, Power AG, Bosque-Perez NA. 2016 June. Condition-dependent vector movement drives the spread of plant pathogens. European Conference on Mathematical and Theoretical Biology / Society for Mathematical Biology joint meeting, Nottingham, UK.

- *Presentation.*

  Shaw AK, Peace A, Power AG, Bosque-Perez NA. 2016 June. Modeling the relative importance of vector life history and behavior in driving pathogen spread. International Plant Virus Epidemiology Symposium, Avignon, France.

- *Song.*

  Stanton KS. 2011. Patterns.

- *Song.*

  Stanton KS. 2011. Rubber Band Land.

Other Publications

- Sturner K (2015). *A Research Collaboration Workshop for Women in Mathematical Biology*. This collaborative workshop aimed to help build a strong collaboration network of women working on problems in mathematical biology by facilitating the formation of new collaborative research groups and encouraging them to continue to work together after the workshop. The format of this workshop was designed to maximize the opportunities to collaborate.. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Gomero B (2011). *Evaluating modeling approaches that forecast infectious disease dynamics and predict disease risks*. Graduate Research Report for the National Center for Medical Intelligence/National Institute for Mathematical and Biological Synthesis Infectious Disease Modeling Workshop, Jan. 23-25. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Yanik B, Lenhart S, Sturner K (2014). *Get involved in outreach!*. Yanik B, Lenhart S, Sturner K. 2014. Get involved in outreach!. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Patents

Technologies or Techniques

Thesis/Dissertations

- Cho EC. *Application of Algebraic Topology to Data Analysis*. (2015). Seoul National University, South Korea. Acknowledgement of Federal Support = Yes
- Levy B. *Modeling Feral Hogs in Great Smoky Mountains National Park*. (2016). University of Tennessee Knoxville. Acknowledgement of Federal Support = Yes

Websites

Back to the top

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Jonsson, Colleen	PD/PI	8
Gross, Louis	Co PD/PI	1
Gavrilets, Sergey	Co-Investigator	3
Lenhart, Suzanne	Co-Investigator	4
Armsworth, Paul	Faculty	1
Bishop, Pam	Faculty	12
Brothers, Ernest	Faculty	2
Buchan, Alison	Faculty	2
Fefferman, Nina	Faculty	1
Reed, Michael	Faculty	1
Riechert, Sue	Faculty	3
Schuchard, Max	Faculty	1
Trout-Fryxell, Rebecca	Faculty	1
Hardison, Brian	K-12 Teacher	2
Flanagan, Sarah	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Johnson, Nels	Postdoctoral (scholar, fellow or other postdoctoral position)	3
Johnson, Quentin	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Siewe, Nourridine	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Smith-Ramesh, Lauren	Postdoctoral (scholar, fellow or other postdoctoral position)	11
Tarasov, Sergei	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Taylor, Robin	Postdoctoral (scholar, fellow or other postdoctoral position)	12
Udiani, Oyita	Postdoctoral (scholar, fellow or other postdoctoral position)	8
Carr, Eric	Other Professional	12

Name	Most Senior Project Role	Nearest Person Month Worked
Clark, Estella	Other Professional	2
Comiskey, Jane	Other Professional	11
Eskridge, Chandra	Other Professional	12
Koosman, Toby	Other Professional	11
LoRe, Sondra	Other Professional	12
Peek, Mike	Other Professional	11
Richters, Ana	Other Professional	8
Spar, Jennifer	Other Professional	11
Sturner, Kelly	Other Professional	7
Wiggins, Greg	Other Professional	4
Crawley, Catherine	Staff Scientist (doctoral level)	12
Welsh, Chris	Staff Scientist (doctoral level)	12
Johnson, Elizabeth	Graduate Student (research assistant)	5
Landerer, Cedric	Graduate Student (research assistant)	5
Massana, Kathryn	Graduate Student (research assistant)	5
Pullen, Robert	Graduate Student (research assistant)	5
Walpitage, Lakmal	Graduate Student (research assistant)	3
Balthrop, Lindsey	Undergraduate Student	1
Denison, Elizabeth	Undergraduate Student	2
Parkman, Virginia	Undergraduate Student	2
Voorhees, Victor	Undergraduate Student	2
Adams, Alison	Research Experience for Undergraduates (REU) Participant	2
Brewer, Sharee	Research Experience for Undergraduates (REU) Participant	2
Dautel, Kimberly	Research Experience for Undergraduates (REU) Participant	2
Dougherty, Owen	Research Experience for Undergraduates (REU) Participant	2
Duwal, Saroj	Research Experience for Undergraduates (REU) Participant	2
Ghatak, Maitraya	Research Experience for Undergraduates (REU) Participant	2
Hommes, Audrey	Research Experience for Undergraduates (REU) Participant	2
Hranov, Axel	Research Experience for Undergraduates (REU) Participant	2
Lerch, Brian	Research Experience for Undergraduates (REU)	2

Name	Most Senior Project Role	Nearest Person Month Worked
	Participant	
Liang, Alan	Research Experience for Undergraduates (REU) Participant	2
Murphy, Quiyana	Research Experience for Undergraduates (REU) Participant	2
Nguyen, David	Research Experience for Undergraduates (REU) Participant	2
Urcuyo, Javier	Research Experience for Undergraduates (REU) Participant	2
Wakhare, Tanay	Research Experience for Undergraduates (REU) Participant	2
Weaver, Lara	Research Experience for Undergraduates (REU) Participant	2
Wise, Patrick	Research Experience for Undergraduates (REU) Participant	2

Full details of individuals who have worked on the project:

Colleen Jonsson
Email: cjonsson@utk.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 8

Contribution to the Project: Dr. Jonsson was the NIMBioS Director through June of this reporting period.

Funding Support: NSF; University of Tennessee

International Collaboration: No
International Travel: No

Louis J Gross
Email: gross@NIMBioS.org
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Dr. Gross was a member of the NIMBioS Leadership Team during most of this reporting period providing advice and supporting NIMBioS in numerous ways. He, along with NISER staff, led the NSF INCLUDES Evaluation workshop.

Funding Support: University of Tennessee; external grants

International Collaboration: Yes, australia, brazil, canada, france, germany, sweden, united

kingdom
International Travel: Yes, france - 0 years, 0 months, 4 days

Sergey Gavrilets
Email: sergey@nimbios.org
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 3

Contribution to the Project: Dr. Gavrilets is the NIMBioS Associate Director for Scientific Activities and member of the NIMBioS Leadership Team. He leads the assessment of requests for support in conjunction with the rest of the Leadership Team and Board of Advisors.

Funding Support: NSF, University of Tennessee

International Collaboration: Yes, australia, france, germany, italy, norway, spain, sweden, switzerland, turkey, united kingdom
International Travel: Yes, russian federation - 0 years, 0 months, 4 days; germany - 0 years, 0 months, 2 days; netherlands - 0 years, 0 months, 2 days; italy - 0 years, 0 months, 1 days; singapore - 0 years, 0 months, 3 days; indonesia - 0 years, 0 months, 3 days; cambodia - 0 years, 0 months, 3 days

Suzanne Lenhart
Email: lenhart@math.utk.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 4

Contribution to the Project: Dr. Lenhart is the Associate Director for Education and Outreach and member of the NIMBioS Leadership Team. She oversees all education and outreach activities and supervises the Outreach and Education Coordinator. She is a regular contributor to many of the activities hosted at NIMBioS, coordinator and mentor for the 2017 Summer Research Experience for Undergraduates.

Funding Support: NSF, University of Tennessee

International Collaboration: Yes, germany, netherlands, spain, tanzania, united republic of
International Travel: Yes, south africa - 0 years, 0 months, 13 days; united kingdom - 0 years, 0 months, 10 days; canada - 0 years, 0 months, 4 days

Paul Armsworth
Email: parmsworth@nimbios.org
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Dr. Armsworth was the NIMBioS Associate Director for Post-doctoral Activities and is still an active member of the NIMBioS Leadership Team.

Funding Support: University of Tennessee

International Collaboration: Yes, australia, mexico, portugal
International Travel: No

Pam Bishop
Email: pbaird@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 12

Contribution to the Project: Dr. Bishop is the NIMBioS Associate Director for STEM Evaluation. She has developed evaluation instruments for NIMBioS activities to support NSF reporting requirements and to assess the success of individual activities and the Center as a whole. She is a leader in developing methods for Center-scale assessment. She has a significant role in planning and managing the NIMBioS participant database and online interface.

Funding Support: NSF, University of Tennessee

International Collaboration: No
International Travel: No

Ernest Brothers
Email: ebrother@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Dr. Brothers is the NIMBioS Associate Director for Diversity Enhancement. He has been instrumental in developing diversity and cultural training opportunities for NIMBioS post-docs and plays a key role in developing and implementing a strategy to increase participation by under-represented groups in NIMBioS activities.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Alison Buchan
Email: abuchan@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 2

Contribution to the Project: Dr. Buchan is the NIMBioS Associate Director for Graduate Education. She manages NIMBioS programs for graduate research.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Nina Fefferman
Email: nfefferm@utk.edu

Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Postdoc mentor, mentor for Summer Research Experience for undergraduates, director of Modeling Center

Funding Support: NSF

International Collaboration: No
International Travel: No

Michael Reed
Email: michael.reed@tufts.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Michael Reed collaborated on a project with Nina Fefferman to use network tools to evaluate vulnerability of the life-cycle networks of migratory birds and early warning signals of tipping points in chronically stressed populations.

Funding Support: NSF; Tufts University

International Collaboration: No
International Travel: No

Sue Riechert
Email: riechert@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 3

Contribution to the Project: Dr. Riechert is a Distinguished Service Professor in the Department of Ecology & Evolutionary Biology at the University of Tennessee. She brings a major outreach program to the Institute: the Biology in a Box Project provides K-12 schools throughout the state of Tennessee materials and exercises that address biological concepts and that are designed to enrich science and math curriculum content.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Max Schuchard
Email: mschucha@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Mentor for Summer Research Experience for Undergraduates

program

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Rebecca Trout-Fryxell
Email: rfryxell@utk.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Mentor for Summer Research Experience for Undergraduates program

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Brian Hardison
Email: brianhardison@sevier.org
Most Senior Project Role: K-12 Teacher
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No

Sarah Flanagan
Email: sflanagan@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Sarah Flanagan (Biology, Texas A&M Univ., 2016) is developing different approaches to generate better a priori

Funding Support: NSF

International Collaboration: Yes, canada
International Travel: No

Nels G. Johnson
Email: Nels.Johnson@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)

Nearest Person Month Worked: 3

Contribution to the Project: Dr. Nels Johnson (Ph.D. Statistics, Virginia Tech) started his NIMBioS post-doctoral fellowship in June 2015. He is investigating novel approaches for biodiversity, multiple species distributions, and community models.

Funding Support: NSF

International Collaboration: No
International Travel: No

Quentin Johnson
Email: quentin.johnson@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Dr. Johnson is a postdoctoral fellow developing a model to identify allostery and the mechanism by which the allosteric signal is initiated and propagated in the peroxisome proliferator-activated receptor and retinoid X receptor complex, which are proteins involved in preventing growth of cancer cells.

Funding Support: NSF

International Collaboration: No
International Travel: No

Nourridine Siewe
Email: nourridine@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Nourridine Siewe (Mathematics, Howard Univ., 2016) is developing mathematical models of visceral leishmaniasis and malaria co-infection to improve the diagnosis and treatment process.

Funding Support: NSF

International Collaboration: Yes, italy
International Travel: No

Lauren Smith-Ramesh
Email: lsmithramesh@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 11

Contribution to the Project: Lauren Smith-Ramesh (Biology, Indiana Univ., 2014) is investigating invasive plants in a food-web context and the direct and indirect effects to native

communities and ecosystems.

Funding Support: NSF

International Collaboration: No
International Travel: No

Sergei Tarasov
Email: tarasov@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Dr. Tarasov begins his postdoctoral fellowship in July 2016. His project is modeling and exploring the evolution of anatomy ontologies using innovative stochastic process and two focal groups of insects.

Funding Support: NSF

International Collaboration: Yes, austria, denmark
International Travel: Yes, austria - 0 years, 0 months, 8 days

Robin Taylor
Email: rtaylor@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Robin T. Taylor (Educational Psychology, Educational Research Methods and Analysis, Auburn University, 2012) is a Postdoctoral Fellow in Science Education Research and Evaluation for the National Institute for STEM Evaluation who is assisting in the development and validation of a Quantitative Biology Concept Inventory (QBCI). The QBCI is intended as a diagnostic tool to identify misconceptions of calculus concepts for students enrolled in life science courses and to evaluate mathematical comprehension of students in the life sciences when learning mathematical concepts in a biological context. Once finalized, the QBCI will be disseminated on a broad scale for use in mathematical education, particularly in courses geared toward students interested in the life sciences.

Funding Support: NSF

International Collaboration: No
International Travel: No

Oyita Udiani
Email: oyita.udiani@nimbios.org
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 8

Contribution to the Project: Oyita Udiani (Applied Mathematics for the Life & Social Sciences, Arizona State Univ.) is using colony founding behavior in paper wasps (Polistes spp.)

to develop a framework for the study of learning in games with stochastic payoffs.

Funding Support: NSF

International Collaboration: No
International Travel: No

Eric Carr
Email: carr@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 12

Contribution to the Project: Eric is the full-time NIMBioS Computational Data Engineer. He provides support for all participant and staff HPC. He provides scientific computing support for groups as needed, provides IT support for all participants, and researches and recommends resources for virtual collaborations. He is managing the new Spatial Analysis Laboratory at NIMBioS.

Funding Support: NSF

International Collaboration: No
International Travel: No

Estella Clark
Email: eclark4@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: Estella handled duties of the Event and Travel Coordinator while Jennifer was on maternity leave.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Jane Comiskey
Email: ecomiske@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 11

Contribution to the Project: Jane is a Senior Analyst and Webmaster for NIMBioS. She developed and maintains the award-winning NIMBioS website, provides IT support, provides coding support for scientific activities, and supports web-communications for activity participants.

Funding Support: NSF

International Collaboration: No
International Travel: No

Chandra Eskridge
Email: ceskridge@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 12

Contribution to the Project: Chandra serves as Executive and Business Assistant for NIMBioS, supporting the Director and operating as a key member of the business and travel staff. She manages the main office and processes reimbursement requests for all staff and visitors.

Funding Support: NSF

International Collaboration: No
International Travel: No

Toby Koosman
Email: tkoosman@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 11

Contribution to the Project: Toby is the NIMBioS Business Manager. She handles all accounting, inventory, contracting, and personnel procedures and has primary responsibility for all purchasing and financial management ofparticipant support activities. She is the direct supervisor of the Event and Travel Coordinator and generally oversees the entire business office.

Funding Support: NSF, University of Tennessee

International Collaboration: No
International Travel: No

Sondra LoRe
Email: sondra@utk.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 12

Contribution to the Project: Sondra LoRe is an Evaluation Associate for NIMBioS Evaluation Services where she assists with both internal and external evaluations related to STEM programs and projects.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Mike Peek
Email: peek@nimbios.org
Most Senior Project Role: Other Professional

Nearest Person Month Worked: 11

Contribution to the Project: Michael is the NIMBioS Information Technology (IT) Manager. He provides all IT support, basic hardware and connectivity, software and applications for collaborative services. He oversees the IT staff, which includes a computational data engineer and a senior analyst.

Funding Support: NSF, University of Tennessee

International Collaboration: No
International Travel: No

Ana Richters
Email: richters@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 8

Contribution to the Project: Ana is a full-time Database Specialist and manages the NIMBioS participant database as well as video archives.

Funding Support: NSF

International Collaboration: No
International Travel: No

Jennifer Spar
Email: jthomas@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 11

Contribution to the Project: Jennifer is the NIMBioS Event and Travel Coordinator. She handles all aspects of event management, contracting with hotels, planning catering, providing support for visitors, and arranging travel for all participants.

Funding Support: NSF

International Collaboration: No
International Travel: No

Kelly Sturner
Email: ksturner@nimbios.org
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 7

Contribution to the Project: Kelly was the NIMBioS Outreach and Education Coordinator. She worked closely with Associate Director for Outreach and Education Lenhart to develop and manage all NIMBioS outreach and education activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Greg Wiggins
Email: wiggybug@utk.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 4

Contribution to the Project: Greg is the NIMBioS Outreach and Education Coordinator replacing Kelly Sturner. He works closely with Associate Director for Outreach and Education Lenhart to develop and manage all NIMBioS outreach and education activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Catherine Crawley
Email: ccrawley@nimbios.org
Most Senior Project Role: Staff Scientist (doctoral level)
Nearest Person Month Worked: 12

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

Funding Support: NSF

International Collaboration: No
International Travel: No

Chris Welsh
Email: cwelsh@nimbios.org
Most Senior Project Role: Staff Scientist (doctoral level)
Nearest Person Month Worked: 12

Contribution to the Project: Dr. Welsh is the NIMBioS Deputy Director and member of the NIMBioS Leadership Team. He is responsible for overseeing day-to-day operations of the center, supervises most of the staff, and interacts regularly with activity organizers, visitors, and other collaborators. He is also involved in Outreach and Education efforts.

Funding Support: NSF

International Collaboration: No

International Travel: No

Elizabeth Johnson
Email: ejohns60@vols.utk.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 5

Contribution to the Project: Elizabeth Johnson is doctoral candidate in microbiology. Her research focuses on constructing ordinary differential equations to examine the kinetics of HIV evolution within patients. She also uses computational methods to create fitness landscapes of the HIV genome from cross-sectional samples of HIV sequences.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Cedric Landerer
Email: clandere@vols.utk.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 5

Contribution to the Project: Cedric Landerer is a doctoral student in ecology and evolutionary biology. His research focuses on the use and development of mathematical and computational methods to infer protein properties such as synthesis rate, co-translation folding, and optimal amino acid usage and their evolution within and across species, from patterns of codon usage.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Kathryn Massana
Email: kmassana@utk.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 5

Contribution to the Project: Kathryn Massana is a doctoral student in ecology and evolutionary biology. Her research focuses on developing a new continuous biogeography model that will infer the ancestral geographic range of taxa and will incorporate dispersal barriers, allow for heterogeneity in dispersal estimation and have the ability to use multi-gene data.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Robert Pullen
Email: rpullen2@vols.utk.edu

Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 5

Contribution to the Project: Robert Pullen is a doctoral student in chemical engineering. His research uses computational methods to investigate how receptor-ligand binding kinetics and membrane mechanics govern the interactions of a T cell with an antigen-presenting cell.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Lakmal Walpitage
Email: dwalpita@vols.utk.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Lakmal Walpitage was a doctoral student in the Evaluation, Statistics, and Measurement Program in the Department of Educational Psychology. At NIMBioS, he worked on projects related to NIMBioS Evaluation Services.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Lindsey Balthrop
Email: lbalthro@utk.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Lindsey is an undergraduate majoring in Public Relations. She works with event planning staff for meeting support and assists with other projects as needed.

Funding Support: NSF

International Collaboration: No
International Travel: No

Elizabeth Denison
Email: edenison@utk.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Elizabeth was an undergraduate majoring in Microbiology. She worked with event planning staff for meeting support and assists with other projects as needed. She has graduated and will move on to graduate school in the fall.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Virginia Parkman
Email: vparkman@vols.utk.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Virginia is an undergraduate majoring in mathematics. She is working with the NIMBioS Education and Outreach program.

Funding Support: NSF

International Collaboration: No
International Travel: No

Victor Voorhees
Email: tor@nimbios.org
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Victor is an undergraduate majoring in Industrial Engineering. He handles video-editing of recorded seminars and assists with variety of project tasks as needed.

Funding Support: University of Tennessee

International Collaboration: No
International Travel: No

Alison Adams
Email: alisonkayadams@gmail.com
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Sharee Brewer
Email: sharee.nicole95@gmail.com

Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Kimberly Dautel
Email: kimberly.dautel1@marist.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Owen Dougherty
Email: odougher@vols.utk.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Saroj Duwal
Email: sduwal@uno.edu

Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Maitraya Ghatak
Email: mghatak@vols.utk.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Audrey Hommes
Email: audrey.hommes@gmail.com
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Axel Hranov
Email: ahranov@vols.utk.edu

Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Brian Lerch
Email: bal88@case.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Alan Liang
Email: al762@cornell.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Quiyana Murphy
Email: quiyanamp1@gmail.com

Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

David Nguyen
Email: david.th.nguy@gmail.com
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Javier Urcuyo
Email: jurcuyo@asu.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Tanay Wakhare
Email: twakhare@gmail.com

Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Lara Weaver
Email: lweaver3@vols.utk.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

Patrick Wise
Email: patwise@udel.edu
Most Senior Project Role: Research Experience for Undergraduates (REU) Participant
Nearest Person Month Worked: 2

Contribution to the Project: Participant in the NIMBioS' summer 2016 Summer Research Experience for undergraduate program.

Funding Support: NSF

International Collaboration: No
International Travel: No
Year of schooling completed:
Home Institution:
Government fiscal year(s) was this REU participant supported:

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
AAAS-American Association for Advancement of Science	Academic Institution	Washington, D.C.
AIBS-American Institute of Biological Sciences	Academic Institution	Reston, VA
Cyverse	Academic Institution	Tucson, AZ
DIMACS-Center for Discrete Mathematics & Theoret. Comp. Sci.	Academic Institution	Rutgers University
Fields Institute	Academic Institution	Toronto, Ontario, Canada
Fisk University	Academic Institution	Nashville, TN
Great Smoky Mountains Institute at Tremont	Other Nonprofits	Townsend, TN
Great Smoky Mountains National Park	Other Organizations (foreign or domestic)	Gatlinburg, TN
Greater Knoxville Math/Science Coalition	Academic Institution	Knoxville, TN
Howard University	Academic Institution	Washington, D.C.
Innovative Computing Laboratory	Academic Institution	Knoxville, TN
Institute of Biomedical Engineering	Academic Institution	University of Tennessee
AWM-Association for Women in Mathematics	Other Nonprofits	Fairfax, VA
JICS-Joint Institute for Computational Science	Academic Institution	University of Tennessee
MBI-Mathematical Biosciences Institute	Academic Institution	Ohio State University
MSRI-Mathematical Sciences Research Institute	Academic Institution	Berkeley, CA
NCEAS-National Center for Ecological Analysis and Synthesis	Academic Institution	University of California - Santa Barbara
NEON-National Ecological Observatory Network, Inc.	Academic Institution	Boulder, CO
NICS-National Institute for Computational Science	Academic Institution	Oak Ridge, TN
NSF Mathematical Sciences Diversity Committee	Academic Institution	various
NSF Mathematical Sciences Institutes	Academic Institution	various
NSF-XSEDE Extreme Science and Engineering Environment	Academic Institution	various
Oak Ridge National Laboratory	Other Organizations (foreign or domestic)	Oak Ridge, TN
Alfred P. Sloan Foundation	Other Nonprofits	New York, NY

Name	Type of Partner Organization	Location
PEER-Program for Equity and Excellence in Research	Academic Institution	University of Tennessee
QUBES (Quantitative Undergraduate Biology Education and Synt	Academic Institution	Unity College, Unity, ME
SACNAS-Society for the Advancement of Chicanos and Native Am	Academic Institution	Santa Cruz, CA
SAMSI-Statistical and Applied Mathematical Sciences Institut	Academic Institution	Research Triangle Park, NC
SESYNC-National Social-Environmental Synthesis Center	Academic Institution	University of Maryland
SHADES-Sharing Adventures in Engineering & Science	Academic Institution	Knoxville, TN
SIAM-Society for Industrial and Applied Mathematics	Academic Institution	Philadelphia, PA
SMB-Society for Mathematical Biology	Academic Institution	international
South-East Alliance for Persons with Disabilities	Academic Institution	Auburn, AL
Syngenta Corp.	Industrial or Commercial Firms	Research Triangle Park, NC
BioQUEST Curriculum Consortium	Other Nonprofits	Madison, WI
TN-SCORE (Tennessee Solar Conversion and Storage using Outre	Academic Institution	Knoxville, TN
Tennessee Ornithological Society	Other Nonprofits	Clarksville, TN
Tennessee Science Teachers Association	Other Nonprofits	Tennessee
Tennessee State University	Academic Institution	Nashville, TN
Tuskegee University	Academic Institution	Tuskegee, AL
U.S. Army Research Office	Other Organizations (foreign or domestic)	Research Triangle Park, NC
USDA - APHIS - WS - National Wildlife Research Center	Other Organizations (foreign or domestic)	Fort Collins, CO
UT Health Sciences Center	Academic Institution	Memphis, TN
University of Tennessee - Biology in a Box	Academic Institution	Knoxville, TN
University of Texas El Paso	Academic Institution	El Paso, TX
CAMBAM-Centre for Applied Mathematics in Bioscience & Med.	Academic Institution	McGill University, Montreal, Canada
VolsTeach	Academic Institution	University of Tennessee
CEEMS-UT Center for Enhancing Education in Mathematics & Sci	Academic Institution	University of Tennessee

Name	Type of Partner Organization	Location
CURENT: Center for Ultra-wide-area Resilient Electric Energy	Academic Institution	University of Tennessee
California State University San Marcos Foundation	Academic Institution	San Marcos, CA
Center for Synthesis and Analysis of Biodiversity	Academic Institution	Aix-en-Provence, France

Full details of organizations that have been involved as partners:

AAAS-American Association for Advancement of Science

Organization Type: Academic Institution
Organization Location: Washington, D.C.

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS is involved in the AAAS-led effort on Vision and Change in Undergraduate Biology Education. NIMBioS Director Emeritus Gross is a member of the steering committee.

AIBS-American Institute of Biological Sciences

Organization Type: Academic Institution
Organization Location: Reston, VA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS has cooperated with the AIBS to communicate opportunities and discuss co-sponsoring an outreach and education symposium.

AWM-Association for Women in Mathematics

Organization Type: Other Nonprofits
Organization Location: Fairfax, VA

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: NIMBioS Associate Director Lenhart actively seeks collaboration on activities with this group.

Alfred P. Sloan Foundation

Organization Type: Other Nonprofits
Organization Location: New York, NY

Partner's Contribution to the Project:
Financial support

More Detail on Partner and Contribution: The Sloan Foundation provided support for the Blackwell-Tapia conference hosted at NIMBioS in October 2016.

BioQUEST Curriculum Consortium

Organization Type: Other Nonprofits
Organization Location: Madison, WI

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: BioQUEST and NIMBioS have collaborated to conduct several workshops at NIMBioS, and NIMBIoS and BioQUEST staff continue to develop plans for joint activities. BioQUEST's Kristin Jenkins is a former member of the NIMBioS Board of Advisors.

CAMBAM-Centre for Applied Mathematics in Bioscience & Med.

Organization Type: Academic Institution
Organization Location: McGill University, Montreal, Canada

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS co-sponsored a summer graduate workshop jointly with MBI and CAMBAM in summer 2017. The theme of this workshop, held at NIMBios in June 2017, was "Connecting Biological Data with Mathematical Models".

CEEMS-UT Center for Enhancing Education in Mathematics & Sci

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS collaborates with CEEMS on a variety of programs, including VolsTeach, to improve preparation of math and science teachers and STEM education.

CURENT: Center for Ultra-wide-area Resilient Electric Energy

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS is collaborating with the engineering research center CURENT (Center for Ultra-wide-area Resilient Electric Energy Transmission Networks), an NSF and DOE engineering research center, to coordinate a week-long Adventures in STEM summer day camp for middle school girls in June 2017 as well as a school visit in May.

California State University San Marcos Foundation

Organization Type: Academic Institution
Organization Location: San Marcos, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS staff are working with CSUSM faculty and staff to increase underrepresented individuals in science careers, with particular connections through the NIH-funded MARC Phase II award at CSUSM. NIMBioS and CSUSM have signed a formal partnership agreement, and NIMBioS scientists have visited and presented at CSUSM.

Center for Synthesis and Analysis of Biodiversity

Organization Type: Academic Institution
Organization Location: Aix-en-Provence, France

Partner's Contribution to the Project:
Other: See detail

More Detail on Partner and Contribution: NIMBioS and CESAB Directors continue to discuss potential collaborations.

Cyverse

Organization Type: Academic Institution
Organization Location: Tucson, AZ

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Formerly iPlant. NIMBioS communicates with Cyverse, NEON, NCEAS, and SESYNC to talk about possible avenues of collaboration between the institutions and centers. The BIO Center Directors have discussed potential collaborations on

research and communication.

DIMACS-Center for Discrete Mathematics & Theoret. Comp. Sci.

Organization Type: Academic Institution
Organization Location: Rutgers University

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS staff and leadership communicate with DIMACS about planning joint activities.

Fields Institute

Organization Type: Academic Institution
Organization Location: Toronto, Ontario, Canada

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS co-sponsored a summer graduate workshop jointly with the Fields Institute, MBI, and CAMBAM in summer 2017. The theme of this workshop, held at NIMBios in June 2017, was "Connecting Biological Data with Mathematical Models".

Fisk University

Organization Type: Academic Institution
Organization Location: Nashville, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS staff are working with Fisk University faculty and staff to increase underrepresented individuals in science careers. Fisk students and faculty have participated in the NIMBioS REU program, the undergraduate research conference, and as short-term visitors. NIMBioS and Fisk have signed a formal partnership agreement, and NIMBioS researchers have visited and presented at Fisk.

Great Smoky Mountains Institute at Tremont

Organization Type: Other Nonprofits
Organization Location: Townsend, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Each summer NIMBioS co-organizes the Girls in

Science program at Tremont to increase involvement of girls in the STEM fields. The NIMBioS Outreach Coordinator also conducted teaching workshops at Tremont, and Tremont is a collaborator with NIMBioS on planning future activities.

Great Smoky Mountains National Park

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Gatlinburg, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS led quantitative biology sessions for the Girls in Science week at Tremont in June 2017 and has met with park staff to explore areas of collaborative research.

Greater Knoxville Math/Science Coalition

Organization Type: Academic Institution
Organization Location: Knoxville, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS hosted and led math activities at the SHADES program geared toward encouraging middle school girls' interest in math and science. (October 2015)

Howard University

Organization Type: Academic Institution
Organization Location: Washington, D.C.

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS has signed a formal partnership with Howard University, a minority-serving institution, to increase the representation of underrepresented minorities in the STEM disciplines. NIMBioS staff and post-docs have visited Howard to discuss research in mathematical biology. Dr. Talitha Washington is a member of the NIMBioS Advisory Board.

Innovative Computing Laboratory

Organization Type: Academic Institution
Organization Location: Knoxville, TN

Partner's Contribution to the Project:
In-Kind Support

Facilities
Collaborative Research

More Detail on Partner and Contribution: The ICL is a large computer science research and development group co-located with NIMBioS. NIMBioS and ICL staff communicate regularly to discuss possible joint activities. NIMBioS provided space for an ICL workshop in May 2017.

Institute of Biomedical Engineering

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: iBME co-sponsored the NIMBioS investigative Workshop on modeling heart rhythm disorders in December 2014, and this led to a NIMBioS working group on Prediction and Control of Cardiac Alternans that met most recently in December 2016.

JICS-Joint Institute for Computational Science

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: JICS is a joint institute between the University of Tennessee and Oak Ridge National Laboratory. JICS staff have collaborated with NIMBioS staff on applications of high-performance computing in biological research as well as on facilitating access to JICS HPC resources at ORNL. JICS and NIMBioS staff are actively working on methods for virtual collaboration and on joint efforts for future activities.

MBI-Mathematical Biosciences Institute

Organization Type: Academic Institution
Organization Location: Ohio State University

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The leadership teams of NIMBioS and MBI are in regular contact regarding potential collaborations. NIMBioS co-sponsors a summer graduate workshop jointly with MBI and CAMBAM. The theme of this workshop, held at NIMBios in June 2017, was "Connecting Biological Data with Mathematical Models".

MSRI-Mathematical Sciences Research Institute

Organization Type: Academic Institution
Organization Location: Berkeley, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS collaborates with MSRI and the other U.S.-based mathematics institutes on the Modern Math Workshop. This year's workshop was held immediately preceding the SACNAS annual conference.

NCEAS-National Center for Ecological Analysis and Synthesis

Organization Type: Academic Institution
Organization Location: University of California - Santa Barbara

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS communicates with NCEAS, NEON, Cyverse, and SESYNC to talk about possible avenues of collaboration between the institutions and centers. The BIO Center Directors have discussed potential collaborations on research and communication.

NEON-National Ecological Observatory Network, Inc.

Organization Type: Academic Institution
Organization Location: Boulder, CO

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS communicates with NEON, NCEAS, Cyverse, and SESYNC to talk about possible avenues of collaboration between the institutions and centers. The BIO Center Directors have discussed potential collaborations on research and communication.

NICS-National Institute for Computational Science

Organization Type: Academic Institution
Organization Location: Oak Ridge, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NICS staff have collaborated with NIMBioS in development of tutorials increasing awareness and ability of biological researchers in use of high-performance computing and have consulted with NIMBioS staff on high-performance computing needs and possible future tutorials. Time on the KRAKEN super-computer operated

by NICS is available as appropriate for activities based at NIMBioS.

NSF Mathematical Sciences Diversity Committee

Organization Type: Academic Institution
Organization Location: various

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS worked with the committee in planning and hosting the Blackwell-Tapia Conference at NIMBioS in October 2016.

NSF Mathematical Sciences Institutes

Organization Type: Academic Institution
Organization Location: various

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS Director and Associate Directors communicate regularly with their counterparts at the various math institutes to develop ideas for collaborative activities. NIMBioS regularly hosts a reception with the other math institutes at the annual Joint Math Meeting. NIMBioS is collaborating on organizing workshops and short courses with these institutes at SACNAS. [AIM, ICERM, IMA, IPAM, MBI, MSRI, NIMBioS, PCMI, and SAMSI]. NIMBioS staff contribute to activities to support participation of underrepresented groups in the mathematical sciences. NIMBioS co-sponsors the annual Joint Mathematics Meetings to advance mathematical achievement, encourage research, and provide communication necessary for progress in the field and contributes to the Modern Math Workshop.

NSF-XSEDE Extreme Science and Engineering Environment

Organization Type: Academic Institution
Organization Location: various

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: The NSF-XSEDE program provides an HPC time allotment to NIMBioS, and NIMBioS staff work with XSEDE staff to facilitate access for NIMBioS-associated researchers.

Oak Ridge National Laboratory

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Oak Ridge, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: A number of ORNL scientists are NIMBioS senior personnel or collaborators.

PEER-Program for Equity and Excellence in Research

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Program for Excellence and Equity in Research (PEER) is an NIH-funded graduate student support program at UTK. NIMBioS faculty and staff collaborated in development of this 'program of excellence' designed to increase numbers of under-represented minority Ph.D.s in science, technology, engineering, and mathematics (STEM) fields. PEER has an emphasis on quantitative biology. NIMBioS regularly provides space for PEER meetings, and Associate Director Lenhart assists PEER with outreach.

QUBES (Quantitative Undergraduate Biology Education and Synt

Organization Type: Academic Institution
Organization Location: Unity College, Unity, ME

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: NIMBioS through NISER has an ongoing project with the QUBES Consortium (Quantitative Undergraduate Biology Education and Synthesis) on methods for program evaluation.

SACNAS-Society for the Advancement of Chicanos and Native Am

Organization Type: Academic Institution
Organization Location: Santa Cruz, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS contributed to the Modern Math Workshop immediately preceeding the Society for the Advancement of Chicanos and Native Americans in Science annual meeting. Goals for this workshop were to reinvigorate the research careers of minority faculty and post docs and mathematics faculty at minority-serving institutions by recruiting them to participate in the 2016-2017 research programs and workshops of US-based Mathematics Institutes and to increase awareness of math-based career paths among

minority undergraduates.

SAMSI-Statistical and Applied Mathematical Sciences Institut

Organization Type: Academic Institution
Organization Location: Research Triangle Park, NC

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS Director and Associate Directors communicate regularly with their counterparts at the various math institutes to develop ideas for collaborative activities. NIMBioS regularly hosts a reception with the other math institutes at the annual Joint Math Meeting. NIMBioS is collaborating on organizing workshops and short courses with these institutes at SACNAS. [AIM, ICERM, IMA, IPAM, MBI, MSRI, NIMBioS, PCMI, and SAMSI]. SAMSI co-organized the Blackwell-Tapia conference with NIMBioS in October 2016.

SESYNC-National Social-Environmental Synthesis Center

Organization Type: Academic Institution
Organization Location: University of Maryland

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS communicates with NEON, NCEAS, Cyverse, and SESYNC to talk about possible avenues of collaboration between the institutions and centers. The BIO Center Directors have discussed potential collaborations on research and communication. NIMBioS and SESYNC are co-sponsors of a joint working group on Human Risk Perception and Climate.

SHADES-Sharing Adventures in Engineering & Science

Organization Type: Academic Institution
Organization Location: Knoxville, TN

Partner's Contribution to the Project:
Collaborative Research
Personnel Exchanges

More Detail on Partner and Contribution: NIMBioS hosted the SHADES program geared toward encouraging middle school girls' interest in math and science. (October 2016)

SIAM-Society for Industrial and Applied Mathematics

Organization Type: Academic Institution
Organization Location: Philadelphia, PA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS and SIAM have discussed opportunities to continue collaborations on workshops and tutorials.

SMB-Society for Mathematical Biology

Organization Type: Academic Institution
Organization Location: international

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS and SMB have discussed opportunities to continue collaborations on workshops and tutorials. SMB is a member of the QUBES consortium.

South-East Alliance for Persons with Disabilities

Organization Type: Academic Institution
Organization Location: Auburn, AL

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS collaborated with the SEAPD-STEM program to encourage STEM students with disabilities and participated in the SEAPD-STEM conference in August 2017.

Syngenta Corp.

Organization Type: Industrial or Commercial Firms
Organization Location: Research Triangle Park, NC

Partner's Contribution to the Project:
Financial support
Collaborative Research

More Detail on Partner and Contribution: Syngenta provided support for and had staff participating in the NIMBioS workshop on Applying Optimization Techniques to Agricultural Problems held May 2017.

TN-SCORE (Tennessee Solar Conversion and Storage using Outre

Organization Type: Academic Institution
Organization Location: Knoxville, TN

Partner's Contribution to the Project:

Collaborative Research

More Detail on Partner and Contribution: NIMBioS, CURENT, and TN-SCORE (Tennessee Solar Conversion and Storage using Outreach, Research and Education) co-host a summer UT STEM REU Symposium. TN-SCORE is Tennessee's first NSF RII Track 1 research infrastructure award which aims to enhance research capacity and competitiveness within Tennessee academic institutions.

Tennessee Ornithological Society

Organization Type: Other Nonprofits
Organization Location: Clarksville, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS staff were part of the organizing committee and designed two math and biology activities for TOS' Discover Birds program. Deputy Director Welsh serves on the Education subcommittee of the Conservation and Research Funding committee.

Tennessee Science Teachers Association

Organization Type: Other Nonprofits
Organization Location: Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS Outreach and Education Coordinator Sturner maintains contact with and collaborates with TSTA on topics related to STEM education in Tennessee.

Tennessee State University

Organization Type: Academic Institution
Organization Location: Nashville, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS has entered a partnership with Tennessee State University, a minority-serving institution, to increase the representation of underrepresented minorities in the STEM disciplines. Tennessee State students participate in the NIMBioS Undergraduate Research Conference. NIMBioS staff and post-docs visit the university and discuss their research with students and faculty.

Tuskegee University

Organization Type: Academic Institution
Organization Location: Tuskegee, AL

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS Associate Director for Diversity Enhancement Ernest Brothers has been exploring potential connections between NIMBioS and Tuskegee, a Historically Black College and University, particularly with respect to recruitment and training of graduate students from underrepresented groups.

U.S. Army Research Office

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Research Triangle Park, NC

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: NIMBioS Director Louis Gross is on the Army Research Office Mathematical Sciences Division Board of Visitors, and Army Research Office staff have visited and participated in activities at NIMBioS.

USDA - APHIS - WS - National Wildlife Research Center

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Fort Collins, CO

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: USDA-APHIS personnel have been regular participants in NIMBioS scientific activities.

UT Health Sciences Center

Organization Type: Academic Institution
Organization Location: Memphis, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Staff from UTHSC participated in the NIMBioS Incubator event designed to promote research collaborations.

University of Tennessee - Biology in a Box

Organization Type: Academic Institution

Organization Location: Knoxville, TN

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Biology in a Box is a fun and challenging way for entire schools to enhance their life sciences curriculum at all grade levels and to encourage student interest in STEM (science, technology, engineering, and mathematics) disciplines. NIMBioS has been adding grade-level appropriate math exercises to boxes. NIMBioS' Kelly Sturner is co-author on a manuscript submitted to the National Sciences Teachers Association journal. A NIMBioS education intern has worked on a number of Biology in a Box projects.

University of Texas El Paso

Organization Type: Academic Institution
Organization Location: El Paso, TX

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: UTEP and NIMBioS have signed a formal partnership agreement to enhance the participation of under-represented minorities in STEM disciplines. These efforts are underway through the NIH-funded MARC Phase II award at UTEP and the Bioinformatics MS program at UTEP. NIMBioS staff and post-docs have visited UTEP to discuss research in mathematical biology.

VolsTeach

Organization Type: Academic Institution
Organization Location: University of Tennessee

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: VolsTeach is a program targeted for undergraduate math, science, or engineering majors who are interested in expanding their professional skills and exploring a career in Secondary Teaching. NIMBioS co-organizes a monthly VolsTeach seminar on issues in teaching STEM (science, technology, engineering and mathematics). NIMBioS and VolsTeach interns worked on the Biology in a Box program.

What other collaborators or contacts have been involved?

Nothing to report

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Impacts

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

A number of the publications resulting from NIMBioS activities appeared in top national and international journals with high impact factors, including Science, PNAS, Nature Communications, Nature Reviews in Microbiology, Biology Letters, Proceedings of the Royal Society B: Biological Sciences. Table 1 in the supporting file included with thissection provides details on NIMBioS-derived publications in certain high-impact journals.

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 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.

Former postdoctoral fellow R. Martin was a co-author of a paper in Science entitled "Precipitation drives global variation on natural selection." The project began when Ryan was a NIMBioS postdoc. Climate change has the potential to affect the ecology and evolution of every species on Earth. Although the ecological consequences of climate change are increasingly well documented, the effects of climate on the key evolutionary process driving adaptation—natural selection—are largely unknown. The group reported that certain aspects of precipitation and potential evapotranspiration, along with the North Atlantic Oscillation, predicted variation in selection across plant and animal populations throughout many terrestrial biomes, whereas temperature explained little variation. By showing that selection was influenced by climate variation, their results indicate that climate change may cause widespread alterations in selection regimes, potentially shifting evolutionary trajectories at a global scale.

Former postdoctoral fellow S. Kawano was a co-author of a paper published in Science entitled "Tail use improves performance on soft substrates in models of early vertebrate land locomotors." In the evolutionary transition from an aquatic to a terrestrial environment, early tetrapods faced the challenges of terrestrial locomotion on flowable substrates, such as sand and mud of variable stiffness and incline. The morphology and range of motion of appendages can be revealed in fossils; however, biological and robophysical studies of modern taxa have shown that movement on such substrates can be sensitive to small changes in appendage use. Using a biological model (the mudskipper), a physical robot model, granular drag measurements, and theoretical tools from geometric mechanics, the authors demonstrated how tail use could improve robustness to variable limb use and substrate conditions. They hypothesized that properly coordinated tail movements could have provided a substantial benefit for the earliest vertebrates to move on land.

Several members of aWorking Group on “Stoichiometry in Metaecosystems” published a paper in Nature Communications entitled “Stability and complexity in model meta-ecosystems.” The diversity of life and its organization in networks of interacting species has been a long-standing theoretical puzzle for ecologists. Ever since Ernest May’s provocative paper challenging whether ‘large complex systems [are] stable’ various hypotheses have been proposed to explain when stability should be the rule, not the exception. Spatial dynamics may be stabilizing and thus explain high community diversity, yet existing theory on spatial stabilization is limited, preventing comparisons of the role of dispersal relative to species interactions. The authors incorporated dispersal of organisms and material into stability–complexity theory. They found that stability criteria from classic theory were relaxed in direct proportion to the number of ecologically distinct patches in the meta-ecosystem. Further, they found the stabilizing effect of dispersal was maximal at intermediate intensity. Their results highlight how biodiversity can be vulnerable to factors, such as landscape fragmentation and habitat loss, which can isolate local communities.

Participation in a Working Group on the “Evolution of Institutions” lead to a paper in PNAS entitled “Collective action and the evolution of social norm internalization.” People often ignore material costs they incur when following existing social norms. Some individuals and groups are often willing to pay extremely high costs to enact, defend, or promulgate specific values and norms that they consider important. Such behaviors decreasing biological fitness represent an evolutionary puzzle. The authors studied theoretically the evolutionary origins of human capacity to internalize and follow social norms. They focused on two general types of collective actions our ancestors were regularly involved in: cooperation to overcome nature's challenges and conflicts with neighboring groups. Their results suggest that norm internalization evolves under a wide range of conditions, making cooperation “instinctive.” They also made a number of testable predictions about individual and group behavior.

Participation in an Investigative Workshop on “Individual-based Ecology of Microbes” lead to a paper entitled “Advancing microbial sciences by individual-based modeling” in Nature Review Microbiology. Remarkable technological advances have revealed ever more properties and behaviors of individual microorganisms, but the novel data generated by these techniques have not yet been fully exploited. In their Opinion article, the authors explain how individual-based models (IBMs) can be constructed based on the findings of such techniques and how they help to explore competitive and cooperative microbial interactions. Furthermore, they describe how IBMs have provided insights into self-organized spatial patterns from biofilms to the oceans of the world, phage–CRISPR dynamics and other emergent phenomena. Finally, they discuss how combining individual-based observations with IBMs can advance our understanding at both the individual and population levels, leading to the new approach of microbial individual-based ecology (μIBE).

What is the impact on other disciplines?

Economics

Members of a Working Group “Evolution and Sustainability” published a paper in Ecological Economicsentitled “The coevolution of economic institutions and sustainable consumption via cultural group selection.” Empirical research has identified various institutions that improve resource longevity by supporting individual resource conservation. However, the mechanisms by which these institutions emerge have not been established. The authors developed a multilevel selection model of resource management institutions with endogenous group dynamics. The endogenous design permits one to determine whether a given social adaptation is due to individual or group-level evolution. They demonstrated how resource conservation and supporting economic institutions coevolve, and revealed when cultural group selection was involved. In their model, sustainable societies emerged in only a minority of cases. Simulations also revealed that property norms facilitate sustainable outcomes most, followed by social group marking, and production norms.

Psychology

NIMBioS Associate Director S. Gavrilets published a paper in Scientific Reports entitled “The evolution of extreme cooperation via shared dysphoric experiences.” Willingness to lay down one’s life for a group of non-kin, well documented historically and ethnographically, represents an evolutionary puzzle. Building on research in social psychology, the authors developed a mathematical model showing how conditioning cooperation on previous shared experience can allow individually costly pro-group behavior to evolve. Their model generated a series of predictions that they then tested empirically in a range of special sample populations (including military veterans, college fraternity/sorority members, football fans, martial arts practitioners, and twins). Their empirical results show that sharing painful experiences produces “identity fusion” – a visceral sense of oneness – which in turn can motivate self-sacrifice, including willingness to fight and die for the group. Practically, their account of how shared dysphoric experiences produce identity fusion helps us better understand such pressing social issues as suicide terrorism, holy wars, sectarian violence, gang-related violence, and other forms of intergroup conflict.

Management and Policies

NIMBioS Associate Director P. Armsworth published a paper in Forest Policy and Economics entitled “Economies of scale in forestland acquisition costs for nature conservation.” Private land trusts commonly acquire and protect forestland for nature conservation and open space preservation. When deciding where and how protection of land should be achieved (e.g., through different contracting arrangements), conservation organizations must account and plan for variation in the costs of protecting land if they are to make efficient use of the limited resources they have available. The authors sought to examine how the costs of protected area acquisition are affected by the size of the protected areas under a fee simple or permanent easement transaction, as well as in comparison to unprotected forest parcels.

What is the impact on the development of human resources?

In the Summer Research Experiences (SRE) for Undergraduates program, students wereprovided training in research procedures, mathematical modeling, R and MATLAB programming, and poster and oral presentations. Professional development activities included sessions on career opportunities, graduate school applications, cross-cultural mentoring, media training and learning to work in teams, including the use of self-assessments. In summer 2017, participants included16 undergraduates in math and biology fields and one high school biology teacher. They worked on five different projects. The group included 6 female and 10 male undergraduate students, and one male high school teacher. Three students were from underrepresented groups.

At our eighth annual Undergraduate Research Conference at the Interface of Biology and Mathematics (October 2016), which attracted 120 participants students and faculty from academic institutions across North America, 35 undergraduate studentsgave talks, and 31 undergraduates presented posters. Students presented on research ranging from a mathematical model of skeletal muscle regeneration to optimal vaccination strategies for cholera. A panel discussion and a graduate school fair gave students ideas for continuing their education.

More details about our educational workshops and our tutorials (for faculty, post-docs and teachers) are in the training and the professional development section of this report.

Our visitor program with our Minority-Serving Institution Partners (Howard University, Tennessee State University, Fisk University, California State University-San Marcos, and University of Texas-El Paso) fosters research and education interactions and collaborations. NIMBioS Postdoctoral Fellows gain cross-cultural experiencesduring these visits.

The NIMBioS Education & Outreach team co-organize and participate in many activities to encourage students and teachers to learn about the interface of biology and mathematics, and we mention some of the activities here. NIMBioS collaborated on the Adventures in STEM Camp, a week-long summer day camp for rising 7th and 8th grade girls on STEM in June 2017. S. Lenhart and K. Sturner helped to organize a visit to Greenback School by graduate students in the Program for Equity and Excellence in Research and in the Ecology and Evolutionary Biology Department; students were engaged in activities using biological and mathematical concepts. We also organized a visit to UT by students and a few teachers from Greenback School in May 2017 with activities to learn about biodiversity in quantitative and qualitative ways.

The Biology in a Box Program, first begun by S. Riechert in 1993, offers an engaging solution to the lack of depth in traditional STEM education in the United States. Activities are provided in a format that teaches important biological concepts and mathematical connections through hands-on community learning. Lessons are packaged within11current thematic units that are available in boxes at most school systems in Tennessee and offered to the worldwide audience at the project's web-site http://biologyinabox.utk.edu. Recent NIMBioS collaborative activities have included working on a new thematic unit (Biomechanics) and led teacher professional development activities at workshops.

We collaborated on the US-Canadian Institutes Summer Graduate Program: Connecting

Biological Data with Mathematical Models, held at NIMBioS in July 2017 with 40 graduate students.

NIMBioS Associate Director for Diversity Enhancement E. Brothers was recognized in 2016 for the Hardy Liston Jr. Symbol of Hope Award, whichgoes to a faculty member, staff member, or friend of the University of Tennessee who demonstrates a commitment to diversity, multiculturalism, and appreciation of the differences in people and cultures on that campus. Brothers presented at the National Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) September 2016. The mission of The National GEM Consortium is to enhance the value of the nation's human capital by increasing the participation of underrepresented groups (African Americans, American Indians, and Hispanic Americans) at the master's and doctoral levels in engineering and science. In November 2016, he presented at the Oak Ridge National Laboratory Career Link Event Day on Diversity and Mentoring in Academia. E. Brothers also provided the NIMBioS post docs with a professional development presentation on the Impact of Generational Diversity on Graduate Education. Lastly, E. Brothers assisted organizing the National Science foundation INCLUDES Conference: Multi-Scaled Evaluation in STEM Education, co-hosted by NIMBioS and NISER February 2017.

What is the impact on physical resources that form infrastructure?

NIMBioS space in the Claxton Building at the University of Tennessee was renovated prior to our occupying the space in April 2012. The renovation created high-quality meeting rooms controlled by NIMBioS that include two large conference rooms, two classrooms (one equipped for video-conferencing), and a tiered auditorium (with A/V recording capabilities) as well as offices for staff, visitors, and post-doctoral and sabbatical fellows. A movable wall between one classroom and the tiered auditorium allows for expansion of the auditorium to accommodate an audience of up to about 60 participants. NIMBioS has the capability to live-stream presentations from the auditorium, which is done routinely for workshops, tutorials, and seminars. This allows access to individuals dispersed around the world who could not be accommodated locally for these activities. NIMBioS allows use of these high quality meeting rooms by other groups both internal and external to the University when not being used for NIMBioS activities. Part of the University’s commitment when Director C. Jonsson started included development of a BSL-3 – rated laboratory housed at the College of Veterinary Medicine that will be a resource for researchers working on a variety of viruses and other materials. While no new physical resources have been added during this reporting period, NIMBioS has allocated a room for the development of a Spatial Analysis Laboratory that will be a resource for both internal and external researchers. In addition, in an effort to encourage interaction among graduate students from a variety of departments we have set up a collaborative meeting space. Much of the design of this room is based on recommendations from current NIMBioS graduate research assistants.

What is the impact on institutional resources that form infrastructure?

NIMBioS has garnered institutional salary support that greatly facilitates collaboration across departments and across campuses as part of the prior negotiated terms of the award and the most recent hire of C. Jonsson. C.Jonsson had input into creation of two faculty lines within the College of Arts and Sciences to increase the number of NIMBioS-affiliated faculty and inspire

new scientific directions for the sustainment of the Institute. Filling these lines has been done with the intent of enhancing and expanding expertise in areas related to the NIMBioS mission. T. Hong joined the faculty of the Department of Biochemistry, Cellular and Molecular Biology in January 2017. His expertise is in modeling of gene regulatory networks. In May 2015, a request was made in collaboration with the Department of Microbiology to hire an Assistant Professor in the area of modeling of microbial community interactions. That position is expected to be filled during the 2017/2018 reporting period. Two original NIMBioS faculty lines were available upon the departure of C.Lanzas and J.Joo. N.Fefferman joined NIMBioS in August 2016 as an associate professor in the Department of Ecology and Evolutionary Biology. N.Fefferman has a wide range of expertise focused on the mathematics of epidemiology, evolutionary and behavioral ecology, and self-organizing behaviors, especially of systems described by networks. M.Papes joined the Department of Ecology and Evolutionary Biology in January 2017. She has expertise in GIS, remote sensing, and spatial analysis and is spearheading the development of the NIMBioS Spatial Analysis Laboratory.

NIMBioS staff have been directly involved with establishing University policies and practices that streamline the process of arranging lodging for participants and other visitors as well as discussions on information requirements for international visitors.

The University of Tennessee has co-located four major projects, each of which receives NSF support. These are NIMBioS, the UT/ORNL Joint Institute for Computational Science, the Computational Geography Research Group, and the Innovative Computing Laboratory. This physical proximity on different floors of the same building enhances the likelihood of further collaborations, joint activities, sharing meeting rooms, and also includes a shared computer facility that more efficiently utilizes machine room space for several users.

NIMBioS Evaluation

NIMBioS offers external evaluation services to the Science, Technology, Engineering, and Mathematics (STEM) research and education sector, with an emphasis on interdisciplinary programs. Under the guidance of NIMBioS Associate Director for STEM Evaluation P. Bishop, the NIMBioS evaluation team provides independent, rigorous and transparent formative and summative evaluation services targeted at the unique goals for the program. What began as NIMBioS Evaluation Services has grown and is now recognized as the National Institute for STEM Evaluation and Research (NISER) under the NIMBioS umbrella.In addition to P. Bishop, the team includes two evaluation associates and a postdoctoral fellow. With expertise in evaluation theory, design and implementation, NISER is capable of evaluating large-scale projects to optimize decision-making and to untangle the complexity of program dynamics in order to understand how and why the project works (or doesn't work) for whom.

What is the impact on information resources that form infrastructure?

NIMBioS provides both hardware and software resources to the community. A 28 core/128 GB ram SMP workstation provides a computational resource for development, simulation and visualization, which enhances the existing 128 core cluster resource. An 8 core/ 32GB windows computational workstation provides a platform for windows based analysis with software tools

VENSIM, ARCGIS, etc. installed. Server resources are utilized to host an R SHINY server for interactive R graphs, rstudio, and Limesurvey surveying platform to perform research data acquisition and evaluation. A recording and streaming service is available through NIMBioS' recording platform and our stream infrastructure (WOWZA). NIMBioS is in the process of acquiring 43 computers with AMD processors that were formerly the Viper cluster at ORNL. Setting this cluster up at NIMBioS could double the computing power available here and enhance the productivity of NIMBioS-affiliated researchers.

The Spatial Analysis Laboratory at NIMBioS will enable cross-disciplinary research within the broader community of biologists and geographers engaged in bio- geographical modeling, spatial statistics, and anthropogenic dimensions of biodiversity conservation. The lab provides data storage and analysis; data visualization; new data collection; and training and outreach. Field instrumentation includes ground- based and low-altitude airborne remote sensing equipment, specifically a terrestrial laser scanner (FARO Focus S 350) and an unmanned aerial system (UAS) with multispectral and LiDAR capabilities. Trimble Juno and R1 units for high accuracy geolocation in the field. In addition, the lab offers high capacity server storage, state-of-the-art software, including ENVI, Trimble, ARCGIS, R, and MATLAB for remote sensing analyses and applications. Workstation support is available to integrate collected data from lab instruments and to support multiple projects in spatial data processing and analysis.

NIMBioS has developed a database system to effectively manage the variety of data we request of participants, to manage applications for activities, and to support the variety of evaluation activities carried out under NIMBioS auspices. This database system, use of which was launched in fall of 2015, has been developed with the expectation that it can be deployed at other similar centers with the diverse range of activities and requirements that NIMBioS has. NIMBioS IT staff have developed a general method to manage and deploy the Linux operating system across many machines, including automated reboot procedures that are minimally disruptive to users. The methods to carry this out are being made available through open-source methods.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

Throughout the year NIMBioS strives to make an impact on society in several ways: (1) education and outreach activities; (2) press releases and radio; and (3) how we function as an organization. Each of these is discussed generally in the following.

NIMBioS supports numerous education and outreach activities throughout the year as a part of its mission to enhance broad public appreciation for the unity of mathematics and science. Outreach to K-12 teachers and students (teacher professional development, field trips, Biology in a Box, research experiences for teachers) aim to inspire the next generation and their teachers about the value of science and math to society, whether they pursue careers in STEM fields or otherwise. Many of our outreach activities have an additional goal to specifically reach out to under-represented groups.

NIMBioS also issues many press releases that get picked up by mainstream media each year, another effort aimed to support greater public understanding of various discoveries that are at the forefront of interdisciplinary life science and mathematics. In addition, as possible we work with the local University radio station by providing interview style conversations on NIMBioS to provide public visibility to the broader mission.

The organizational structure and inherent mission of NIMBioS provides a broad impact on society through our various NSF-funded activities. These include increasing involvement of persons with disabilities and underrepresented minorities in STEM activities. Each supported event encourages participation of these groups and makes an effort to have these voices represented. For example, we have supported a working group that seeks to create new approaches in teaching STEM. Our postdoctoral training program is another important contribution in making an impact on the development of a diverse, competitive academic or industrial workforce. Finally, the enhanced infrastructure provided by NIMBioS offers a vital resource for bringing together diverse scientific groups for research and educational purposes.

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Changes/Problems

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.

Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-1. NIMBioS Board of Advisors Meeting Summaries

NIMBIOS VIRTUAL BOARD MEETING – OCTOBER 19, 2016

Board members participating: Linda Allen, Lydia Bourouiba, Zhilan Feng, John Glasser, Simon Kahan, Jacob LaRiviere, Mark Lewis, Mark McPeek, Claudia Munoz-Zanzi, Pete Richerson, Raina Robeva, and Talitha Washington

Originally planned as a meeting at NIMBioS in Knoxville, this was changed to a virtual meeting when it became apparent only a few Board members would be able to attend in person. As a result, the NIMBioS Board met via teleconference and Zoom Video Conferencing to review requests for support for Investigative Workshops and Working Groups. The Board was provided access to all requests one month prior to the meeting. Each Board member provided feedback on requests prior to the meeting, and the meeting consisted of open discussion of each request. The Board recommended support of two working groups and one workshop request.

NIMBIOS VIRTUAL BOARD MEETING – APRIL 20, 2017

Board members participating: Linda Allen, Lydia Bourouiba, Zhilan Feng, John Glasser, Jacob LaRiviere, Claudia Munoz-Zanzi, Pete Richerson, Jorge Velasco-Hernandez

NIMBioS leadership and staff participating: Colleen Jonsson, Suzanne Lenhart, Sergey Gavrilets, Brian O'Meara, Alison Buchan, Pam Bishop, Chris Welsh, Jane Comiskey, and Eric Carr.

The NIMBioS Board met via teleconference and Zoom Video Conferencing to review requests for support for Investigative Workshops and Working Groups. The Board was provided access to all requests three weeks prior to the meeting. Each Board member provided feedback on requests prior to the meeting, and the meeting consisted of open discussion of each request. The Board recommended support of two working groups and quick revision and reevaluation of one workshop request.

Review of requests was followed by discussion of NIMBioS sustainment efforts. This began with announcement by Director Jonsson that she would be stepping down at the end of June. The NIMBioS Leadership Team will be working with Vice-Chancellor for Research Taylor Eighmy and others within the University of Tennessee administration to identify the process and develop a plan for transitioning to a new director.

The discussion of initiatives building toward sustainment included:

1. Tutorials and Workshops – Sustainment efforts for these activities will be two pronged, with an effort to support some through grants and corporate funds and an effort to launch a registration fee model for others. The

Syngenta corporation is supporting a May workshop, and a registration fee model tutorial is planned for August.

2. Working Groups – Support for Working Groups will need to come from grant submissions.
3. Fund-raising to find support for those needing it for attendance at registration model events.
4. Mathematical Modeling and Consulting Center (MMCC) – In its beginning stages, this initiative, spearheaded by Nina Fefferman, looks to provide modeling expertise to non-modelers.
5. Spatial Analysis Laboratory – This initiative, led by Mona Papes, aims to provide the ability to obtain and assess spatial data. The potential for running it as a recharge center is being considered.
6. Incubators – These are focused activities to encourage development of collaborative networks that may lead to grant submissions. The first was held March 24 with the theme of Emerging Risks, Measured Responses.
7. National Institute for Stem Evaluation and Research (NISER) – NISER was founded in 2016 as an outgrowth of NIMBioS Evaluation Services. NISER provides quality evaluation services to the Science, Technology, Engineering and Mathematics research and education sectors, including academic communities, not-for-profit organizations, and government entities.
8. PI submitted grants – The F&A revenue stream from grants submitted through NIMBioS by NIMBioS-affiliated faculty will be shared among NIMBioS, PIs, and Departments to help support NIMBioS activities.
9. Donations – A mechanism for accepting donations to support activities has been developed and made available via the NIMBioS website.

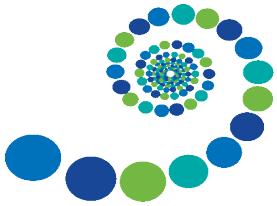
NIMBioS is counting on having a no-cost extension to fulfill remaining commitments from base NSF support, and having that extension will allow more time for sustainment activities to develop/mature.

In a general discussion of sustainment possibilities, a number of suggestions were offered from the Board. One thought was to foster relationships with private organizations to identify questions for which a private-NIMBioS collaboration would be mutually beneficial. Meeting with members of the Business School at the University of Tennessee to discuss potential areas of synergies, perhaps in research and development networks or hierarchical modeling and decision-making, might prove fruitful. It was also suggested that NIMBioS look at other centers and institutes that have been successful in sustaining themselves to see what lessons can be learned.

Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-2. NIMBioS Evaluation Report



NIMBioS

National Institute for Mathematical and Biological Synthesis

NIMBioS EVALUATION REPORT

REPORTING PERIOD NINE

SEPTEMBER 1, 2016 – MARCH 31, 2017

National Institute for Mathematical and Biological Synthesis

May 2017

National Institute for STEM Evaluation and Research

115 Philander P. Claxton Education Building
The University of Tennessee, Knoxville
p. (865) 974-9348
f. (865) 974-9300
http://www.nimbios.org/evaluation

This work was conducted at the National Institute for Mathematical and Biological Synthesis, sponsored by the National Science Foundation through NSF Award #DBI-1300426, with additional support from The University of Tennessee, Knoxville.

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CIPP Model

Context Evaluation assesses needs, assets, problems and opportunities within a defined environment.

Input Evaluation identifies and compares relevant approaches by examining resources, strategies, and work plans of different approaches.

Process Evaluation is an ongoing check regarding implementation of program activities and documentation of the process.

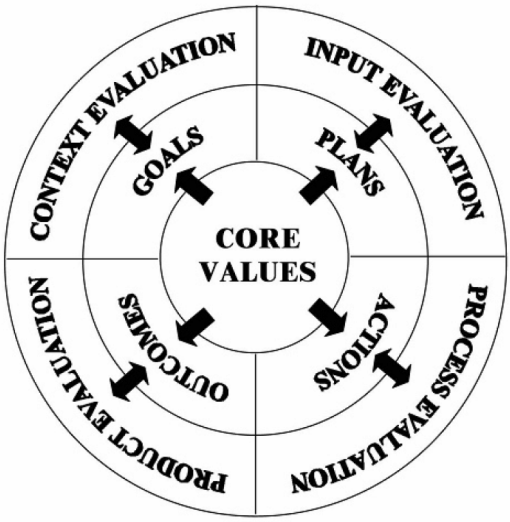
Product Evaluation assesses outcomes of the program.

Stufflebeam, D. L. (2003). The CIPP Model for evaluation. In D. L. Stufflebeam, G. F. Madaus, & T. Kellaghan (Eds.), *Evaluation Models* (2nd ed. Pp. 279-317). Norwell,MA: Kluwer

INTRODUCTION

This is an evaluation summary of NIMBioS activities during the ninth annual reporting period (RP 9) to the National Science Foundation. This report covers the period of September 1, 2016 through March 31, 2017. The NIMBioS evaluation program follows the CIPP systems approach, which considers not only the outcomes of the center, but how the outcomes are achieved. The evaluation addresses four main interconnected evaluation phases as seen in Figure 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 EVALUATION

Context evaluation 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.

INPUT EVALUATION

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:

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

PROCESS EVALUATION

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.

PRODUCT EVALUATION

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 be 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.

ACTIVITIES – REPORTING PERIOD 9

Research program activities:

Activity	AR9	Overall
Working Group meetings	15	**53**
Investigative Workshop	1	**42**
Tutorials	0	**20**
Postdoctoral Fellows	8	**46**
Short-term visitors	23	**344**
Visiting graduate student fellow	0	**7**
Sabbatical	0	**17**

Education and Outreach (EO) program activity highlights:

NIMBioS Interdisciplinary Seminar Series
Biology in a Box Program
Summer Research Experiences (SRE) Program
Undergraduate Research Conference at the Interface of Biology and Mathematics
UT STEM REU Symposium
Joint MBI-CAMBAM-NIMBioS Summer Graduate Workshop
Blackwell-Tapia Conference and Award Ceremony
Uncertainty Quantification Tutorial
RevBayes Tutorial
Modern Math Workshop at SACNAS meeting

Other events: 2 Virtual Advisory Board Meetings

DIVERSITY OF RESEARCH ACTIVITIES

NIMBioS is interested in supporting research activities from diverse subject areas. Working Group and Investigative 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.

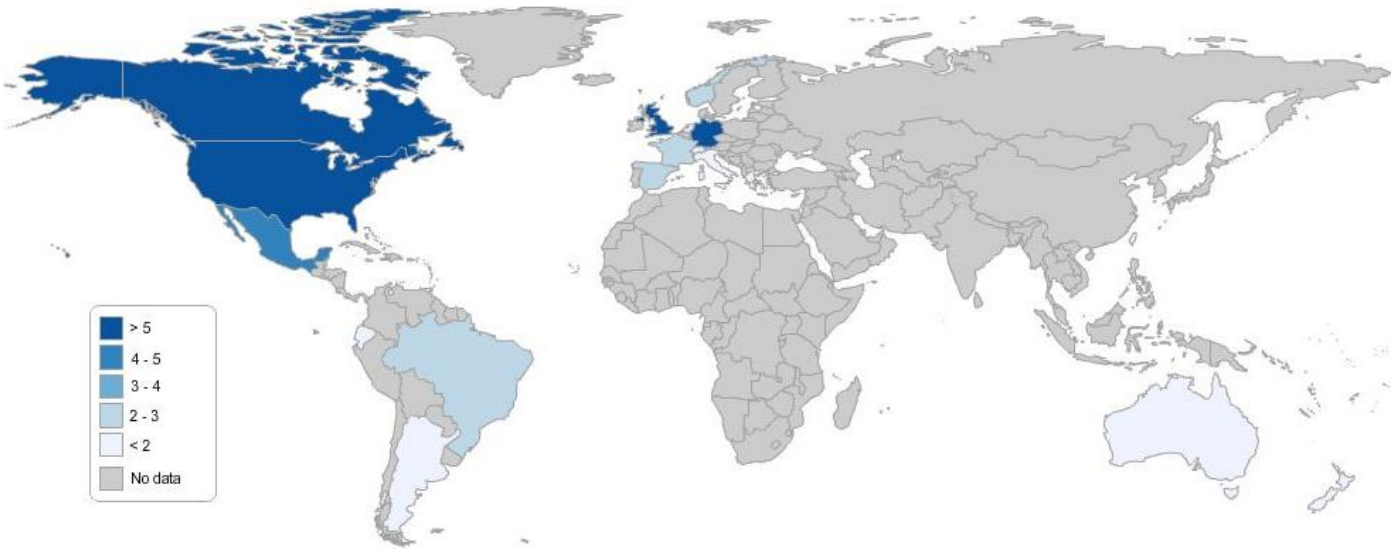
DIVERSITY OF PARTICIPANTS

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. Electronic submission of demographic variables aligned to the reporting requirements of the National Science Foundation is requested of participants before participation in any NIMBioS event.

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.

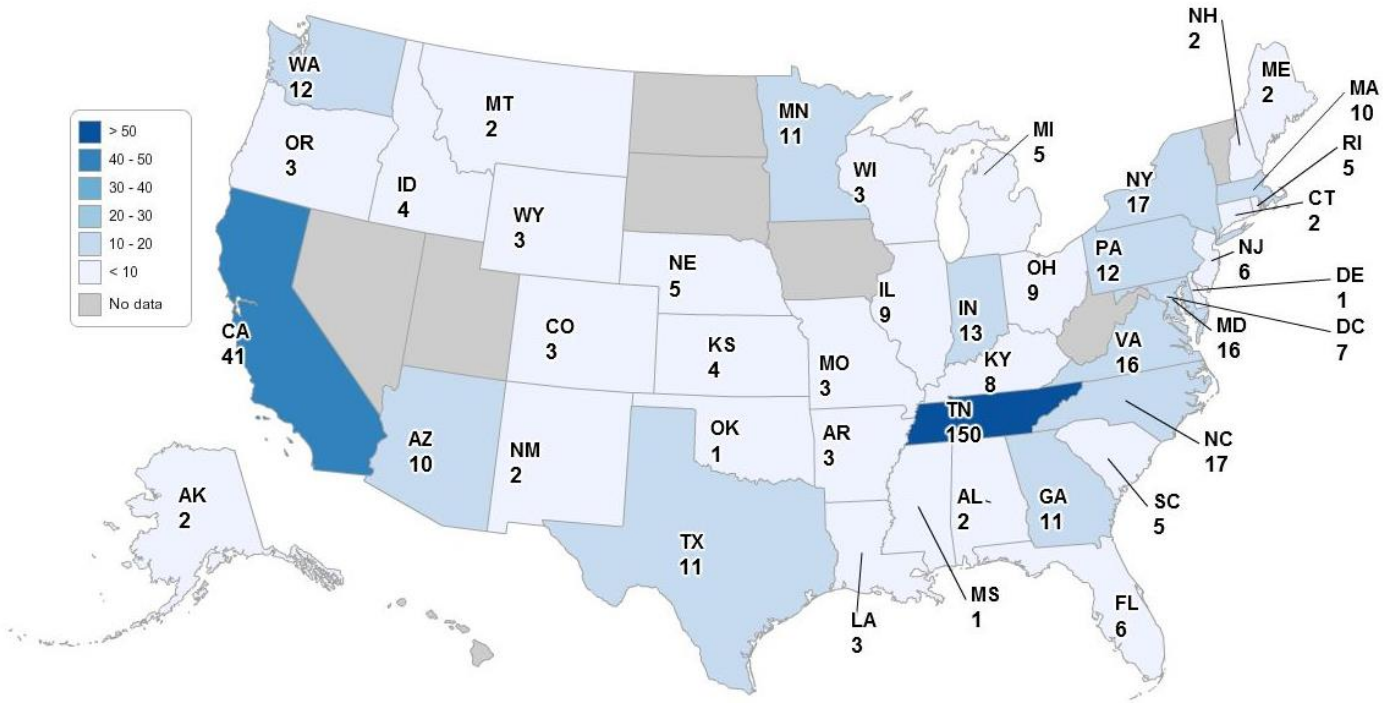
Geographic Diversity. During RP 9, 589 participants (479 unique individuals) from 19 countries participated in NIMBioS events. Most participants came from the United States (88.8%), followed by Canada (2.7%) and The United Kingdom (2.4%) (Figure 2). Roughly 1.4% of participants did not indicate country.

Figure 2. NIMBioS RP 9 participants by country



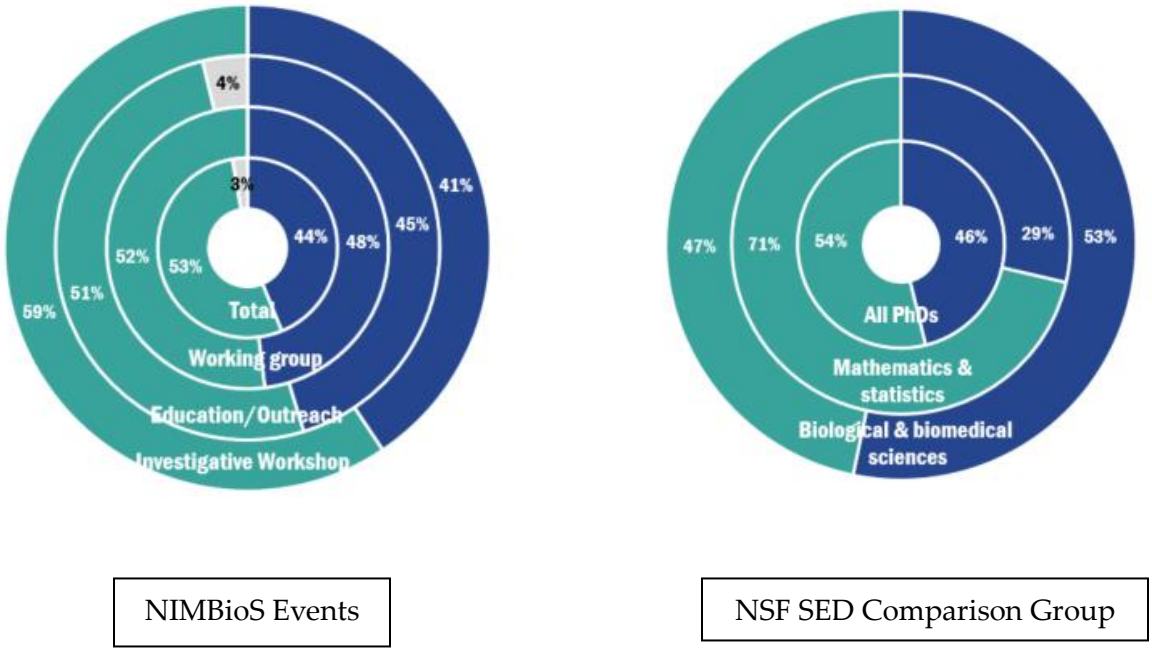
Within the U.S., 42 different states, as well as the District of Columbia and Puerto Rico, were represented. The largest percentage of participants came from within Tennessee (28.7%), followed by California (7.8%), North Carolina (3.2%), New York (3.2%), Virginia (3.1%), and Maryland (3.1%) (Figure 3).

Figure 3. NIMBioS RP 9 participants by U.S. state



Gender, Racial, and Ethnic Diversity. Across all events during RP 9, female participation was 43.8% (no gender data for 2.7%). Within specific activity types, the gender ratio varied slightly, from 48% in Working Groups to 41% in Investigative Workshops (**Figure 5**). Comparison groups shown are all individuals receiving doctorates, and all individuals receiving doctorates in biology and mathematics in the U.S. In 2015 (data from NSF Survey of Earned Doctorates). The overall distribution of females in NIMBioS activities falls within the range of practicing Ph.D.'s in biology and mathematics in the U.S.

Figure 4. Composition of participants by event type and earned doctorates for females, males, and not Reported.



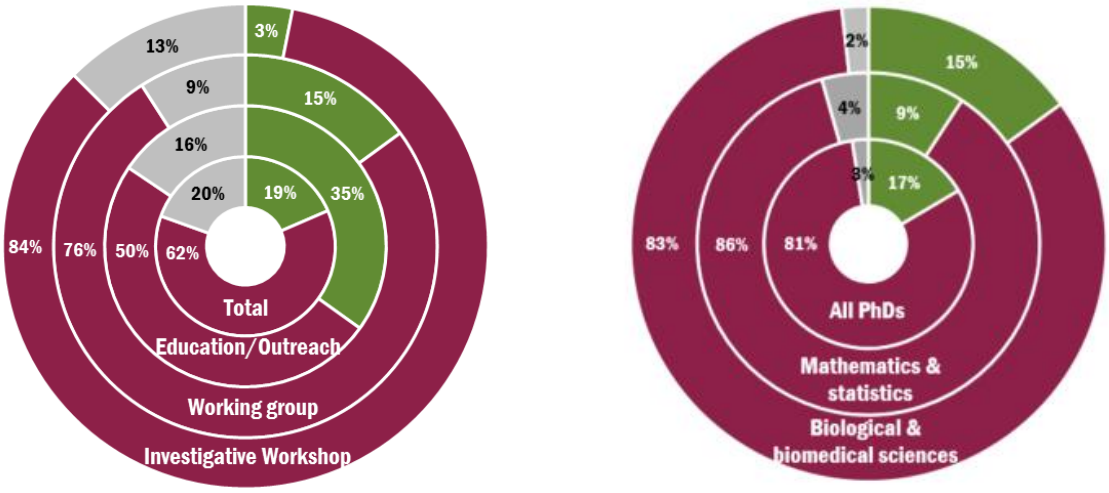
NIMBioS Events

NSF SED Comparison Group

Overall minority representation across NIMBioS events during RP 9 was 18.5%, and falls within ranges for doctoral recipients in the biological and mathematical sciences (Figure 5). Comparison groups shown are all U.S. citizen and permanent residents receiving doctorates, and receiving doctorates in biology and mathematics in the U.S. in 2015[1]. Minority representation varied among programs.

[1] For the purposes of this report, "minority" refers to those who self-identify as American Indian or Alaska Native, black or African American, and/or Hispanic or Latino (NSF Survey of Earned Doctorates, 2015)

Figure 5. Minority representation of NIMBioS participants for underrepresented minority participants, not underrepresented and not reported.

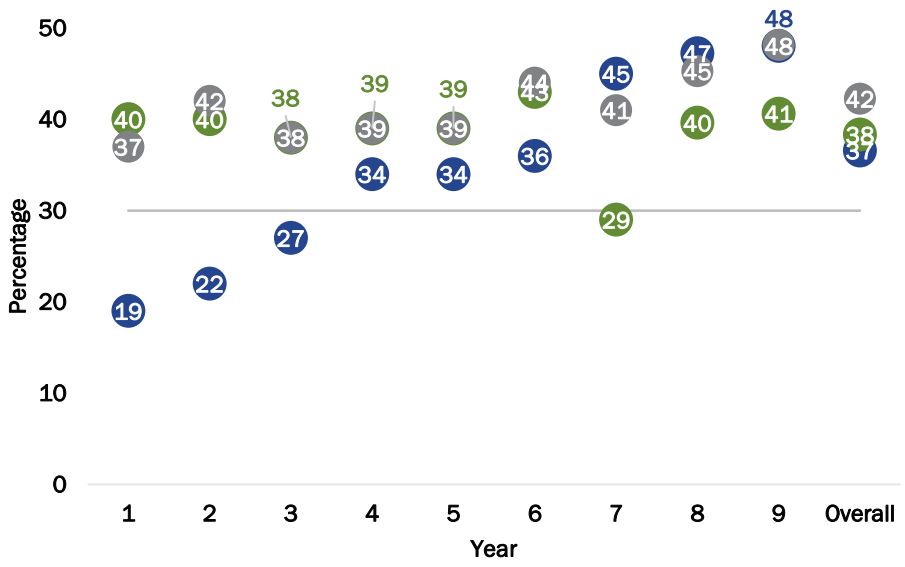


NIMBioS Events

NSF SED Comparison Group

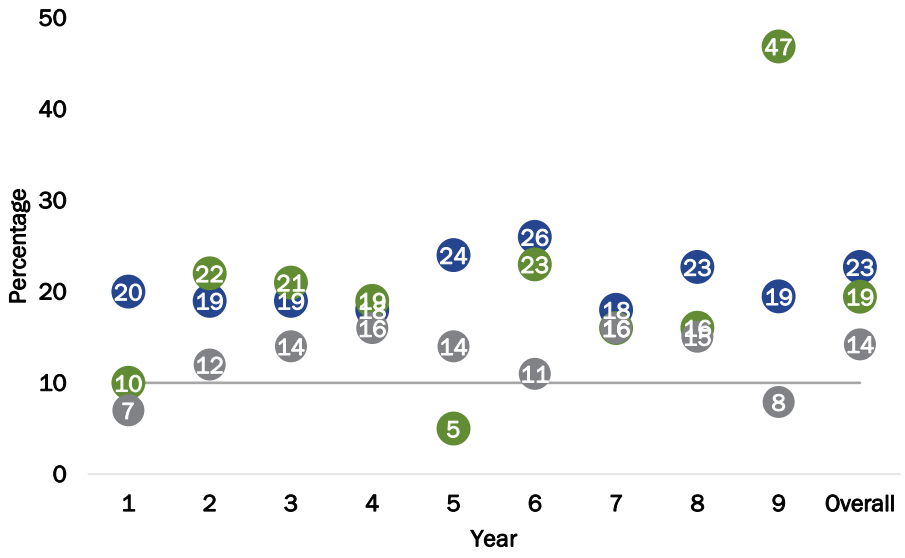
Diversity Benchmarks. Per the suggestion of the site review carried out at NIMBioS in June 2010, the NIMBioS leadership team has consulted with the NIMBioS advisory board in response to the recommendation by the site review committee that we establish a variety of benchmarks for our programs. The site review committee 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 are provided in Figures 6 to 11:

Figure 6. Proportion of female participants across all NIMBioS activities, Working Groups and Investigative Workshops by year



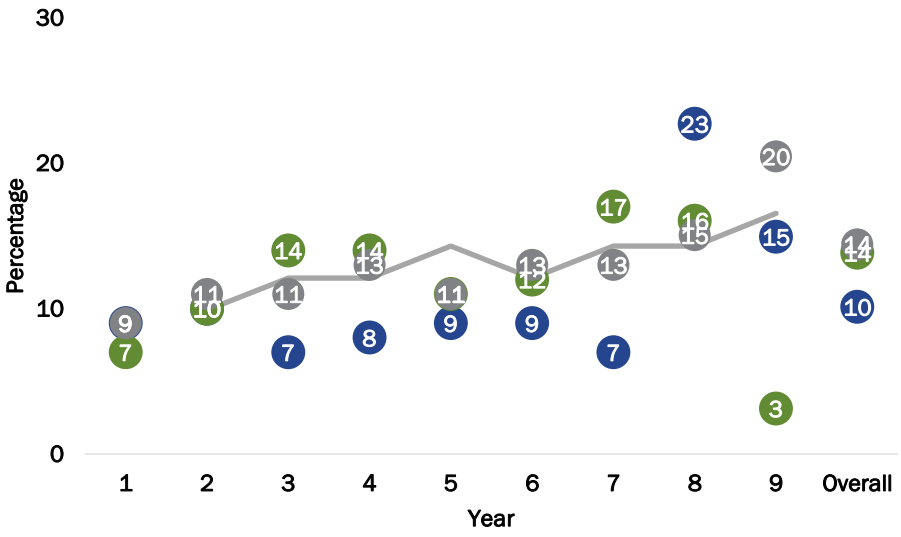
Benchmark. The proportion of female participants will be at least 30%.

Figure 7. Proportion of international participants across all NIMBioS activities, Working Groups and Investigative Workshops by year



Benchmark. The proportion of participants from outside the United States will be at least 10%

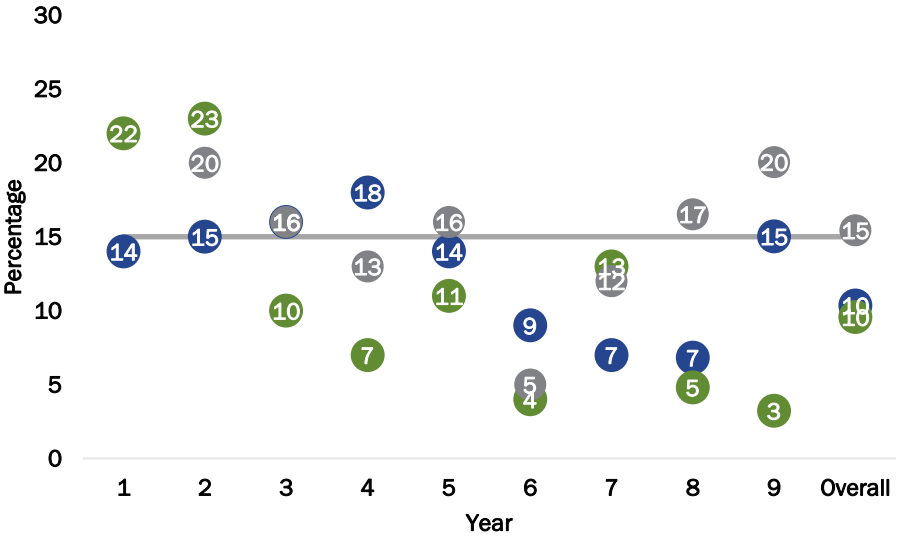
Figure 8. Proportion of participants from under-represented groups across all NIMBioS activities, Working Groups and Investigative Workshops



Benchmark. Increase the percentage of participants from under-represented groups across all NIMBioS activities (including for Working Groups and Investigative Workshops) by approximately 10% per year.

Note. F(t+1) = 1.1F(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).

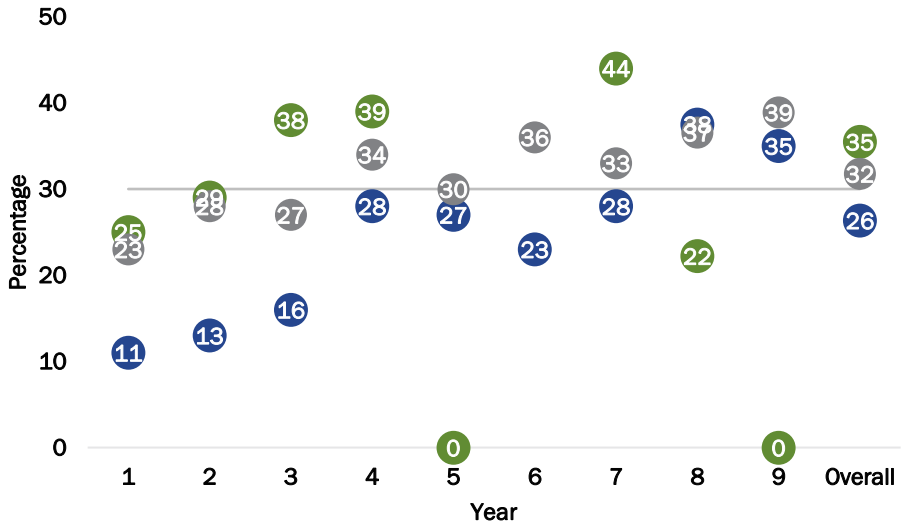
Figure 9. Proportion of local participants across all NIMBioS activities, Working Groups and Investigative Workshops



Benchmark. Limit the 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:

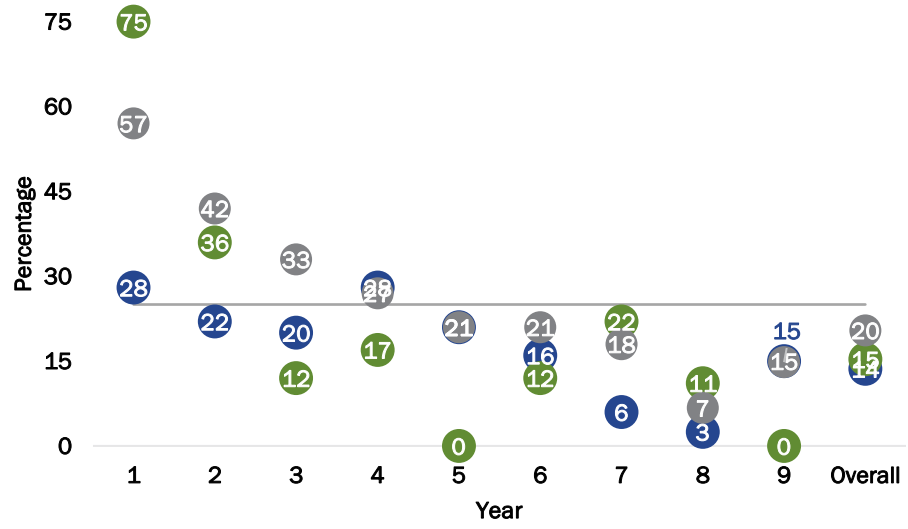
Figure 10. Proportion of female organizers across all Working Groups and Investigative Workshops by year



Benchmark. The proportion of female organizers will be at least 30%.

Note. Only participants who attend events are included in counts – for AR9, a female organizer for the Next Generation Genetic Monitoring workshop was unable to attend the event and therefore, is not represented in the benchmark numbers above. She was one of four organizers for the event, which would have made the percentatge for year 9 25%, had she been able to attend.

Figure 11. Proportion of local organizers across Working Groups and Investigative Workshops



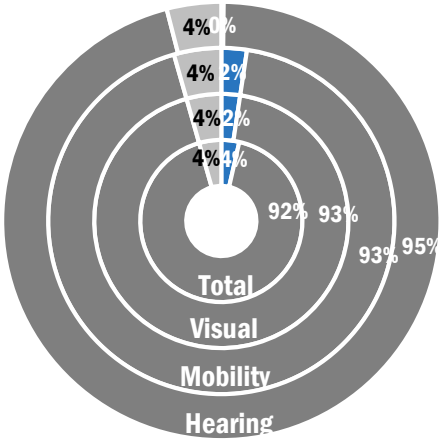
Benchmark.

The participation by local UT/ORNL organizers will be less than 25% of all organizers.

While NIMBioS encourages researchers from underrepresented groups to be organizers/co-organizers of requests for support, no specific goal is set because of the small number of organizers.

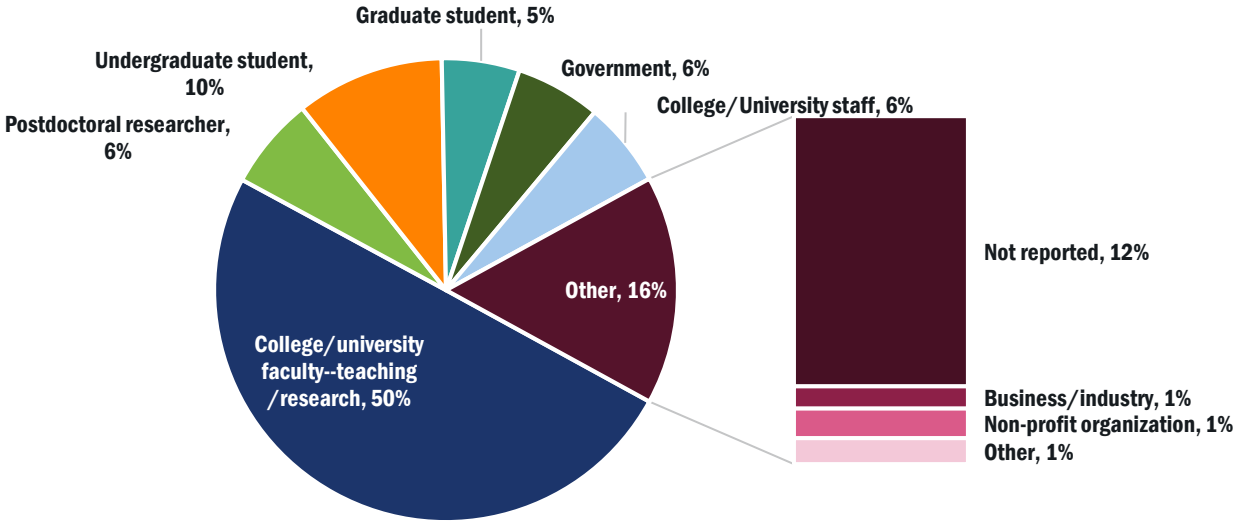
ABILITY DIVERSITY. Disclosure of disability status by participants to NIMBioS is optional. Around 2% overall indicated having some sort of disability during RP 9 **(Figure 12).**

Figure 12. Disability status of participants for Yes, No, and Not reported (*n* = 589)



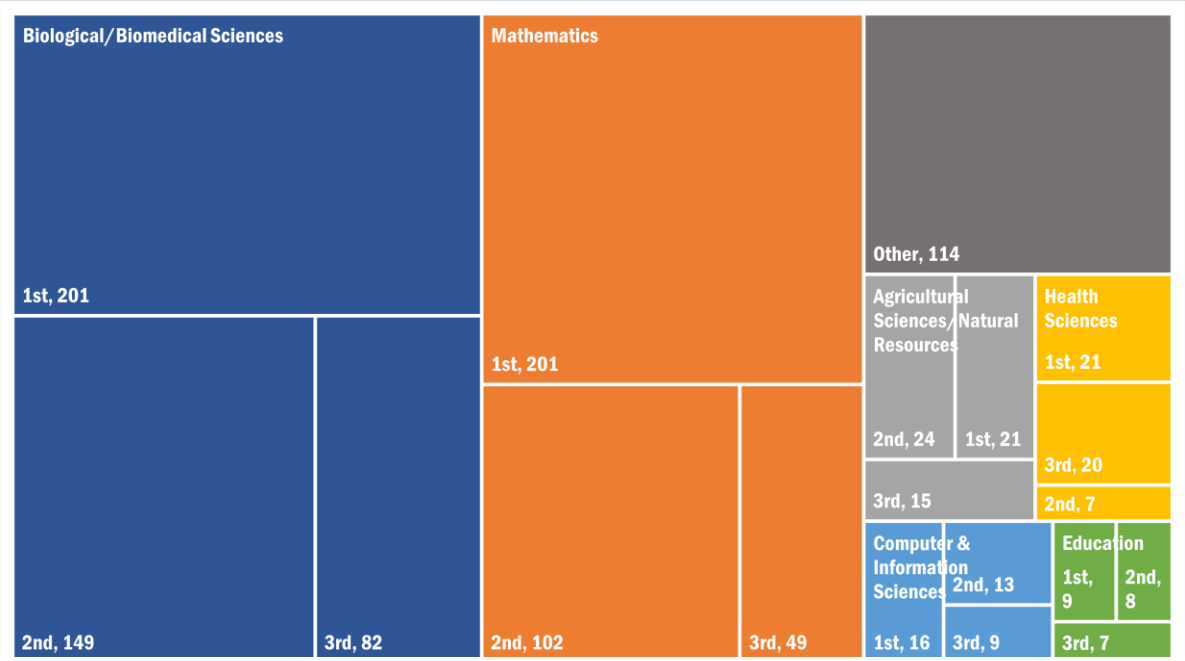
OCCUPATIONAL DIVERSITY. The majority of NIMBioS participants were college/university faculty or staff, undergraduate students, or postdoctoral researchers; however, participants came from government, industry, non-profit, or other positions as well (**Figure 13**).

Figure 13. Employment status of participants (*n* = 589)



DISCIPLINARY DIVERSITY. 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 and mathematics although many other disciplines were represented (**Figure 14**).

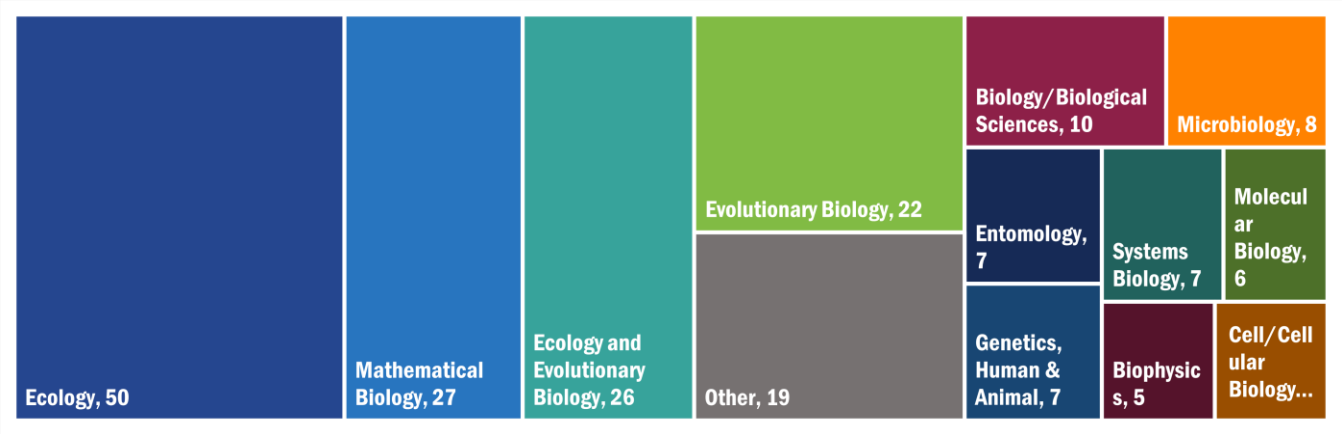
Figure 14. Primary (1st), secondary (2nd), and tertiary (3rd) discipline areas of participants



Note. Other includes Engineering (13, 2, 7), Social Sciences (12, 6, 4), Physics (8, 3, 7), Chemistry (6, 4, 5), Ocean/Marine Sciences (1, 9, 1), Geological & Earth Sciences (- , 7, 1), Business (-, 4, 2), Humanities (1, 3, -), Other professional field (1, -, 2), Astronomy/Meteorology (-, 2, -), Communications (2, -.-), and Psychology (-, 1, -). Counts in parentheses represent primary, secondary, and tertiary discipline area of participants.

The 201 participants indicating Biological/Biomedical Sciences as their primary field of study indicated 24 different areas of concentration within which they would classify their primary areas of research/expertise. The most commonly indicated area of concentration was ecology (30%), followed by ecology & evolutionary biology (14%), and mathematical biology (11%) (**Figure 15**).

Figure 15. Participant expertise area concentrations within biological/biomedical sciences field of study (*n* = 201)



Note. Other concentrations include Biology/Biomedical Sciences (3), Mathematical Ecology (3), Other Concentration (3), Environmental Science (2), Nutrition Sciences (2), Biomedical Sciences (1), Biometrics & Biostatistics (1), Neuroscience (1), Physiology, Human & Animal (1), Plant Genetics (1), and Plant Physiology (1).

INSTITUTIONAL DIVERSITY. Participants during RP 9 represented 187 different institutions, including colleges and universities, government institutions, industry, non-profits, and high schools (Figure 16). Of the 166 universities represented, most were classified as comprehensive (having undergraduate and graduate programs) (**Figure 17**).

Figure 16. Types of institutions represented (*n* = 187)

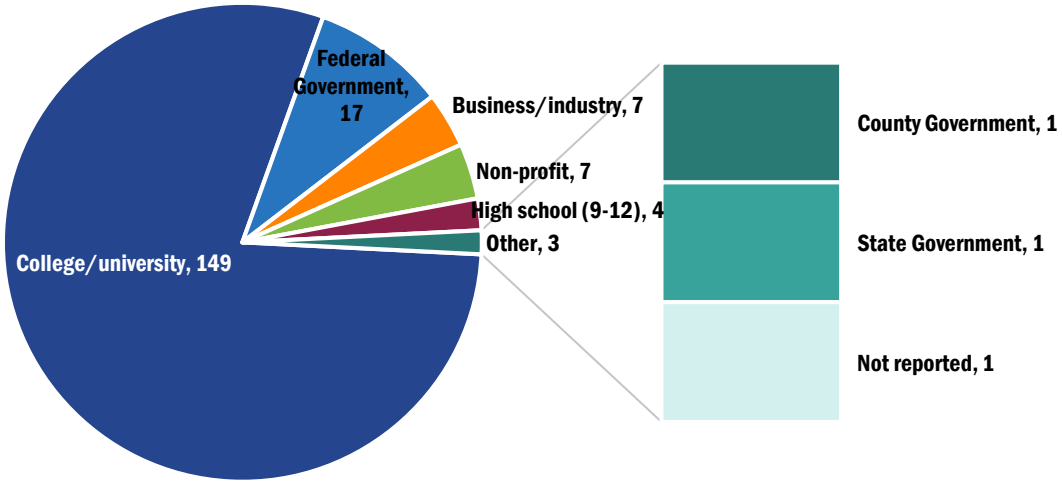
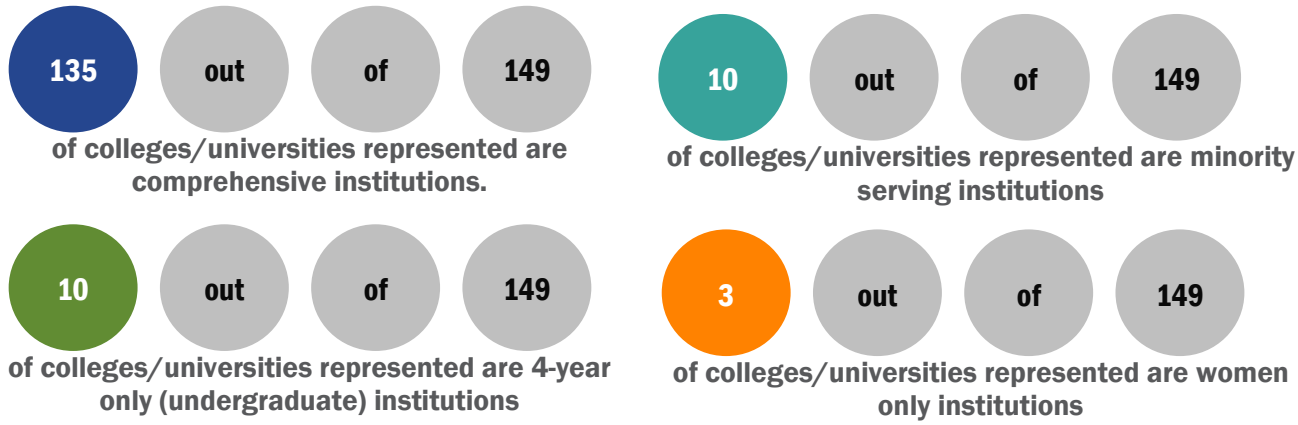


Figure 17. Characteristics of participants' universities (*n* = 176)



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, Tutorial, and Summer Research Experience programs. 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 summary of the process evaluations of NIMBioS' major activities during RP 9.

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: Overall Summary

Number of Working Groups supported by NIMBioS
53

Average membership:
14
(*SD*=3)

Total participation:
762

Total unique participation:
679

Average meeting length:
3.5 days
(*SD*= .87)

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 2-5 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 evaluation highlights are aggregated across all events in their respective categories.

Working Group Summary. During RP 9, NIMBioS hosted 15 Working Group meetings, including the start of 3 new groups and the return of 11 established groups – see Figure 18. A total of 154 participants (144 unique) from 100 institutions took part in the Working Groups. During RP 9, participants came together from 11 different major fields of study to focus on the respective scientific questions of their groups.

Figure 18 . Timeline of AR9 Working Group and Investigative Workshop events including the number of participants for each event

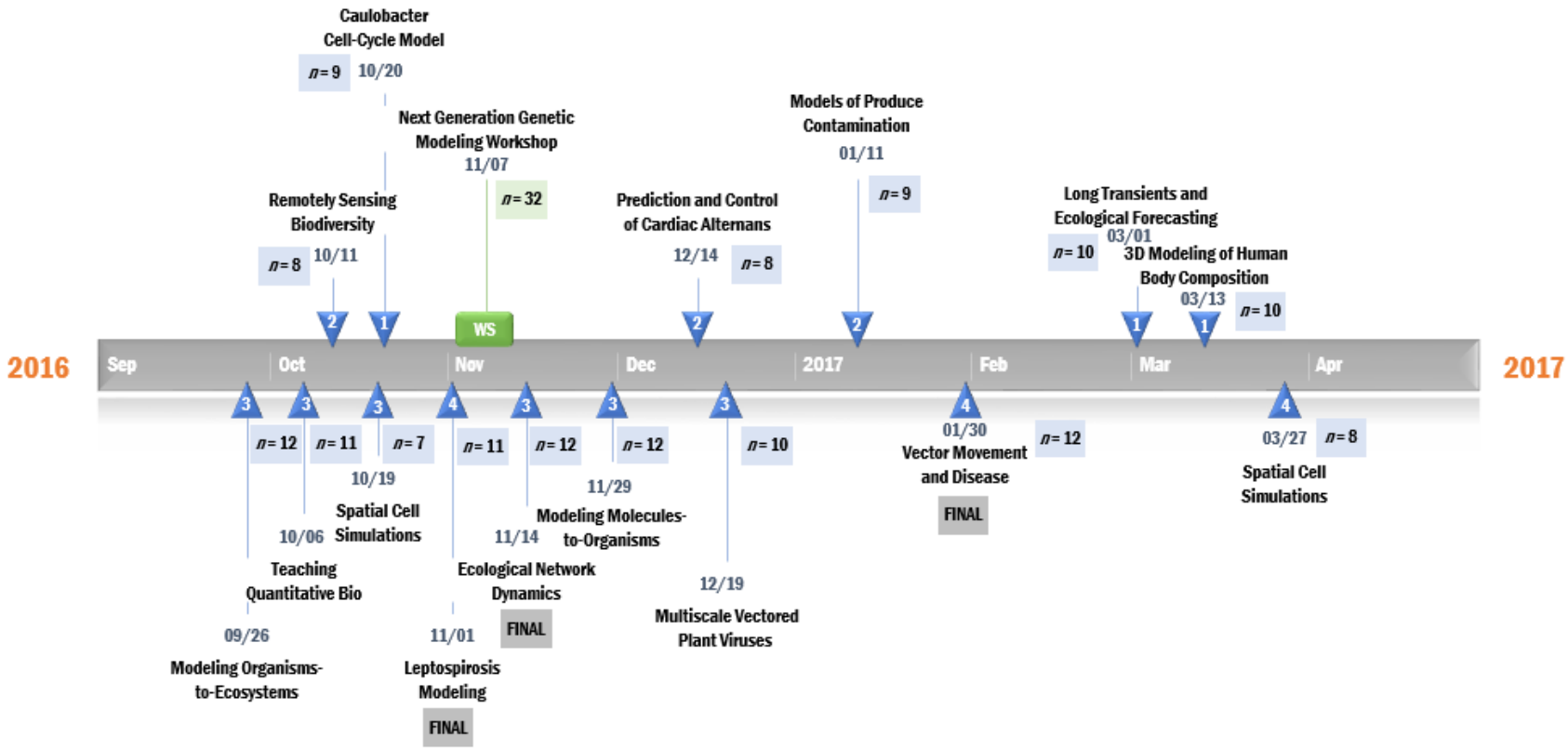
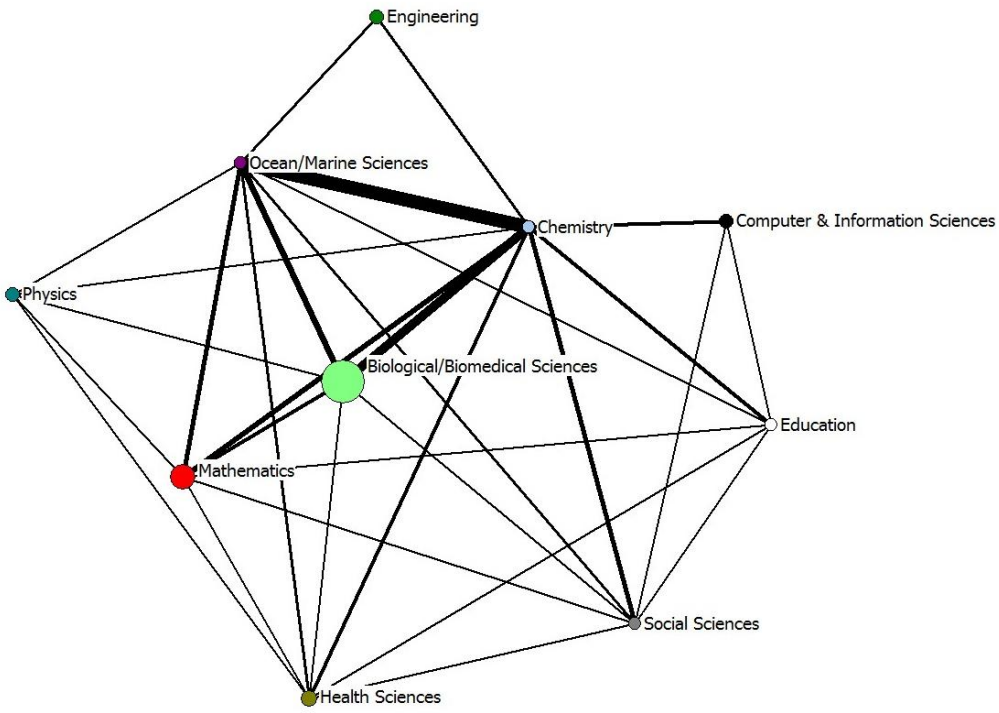


Figure 19 shows the cross-disciplinary connections fostered among Working Group members through the meetings hosted at NIMBioS during RP 9. Node radius is representative of the log scaled number of participants in each field of study. Line size is representative of the number of times researchers from each field were brought together to collaborate and problem-solve at NIMBioS.

Figure 19. Working Group cross-disciplinary collaboration



Working Group Organizer feedback

NIMBioS collects overall 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? 100% of organizers (n = 33) were very satisfied (n =27) or satisfied (n = 6) with how NIMBioS managed their working group event.

100% of organizers were satisfied with how NIMBioS handled the event!

From the organizers:

> The staff was very helpful, both in planning the meetings, when we were at the meeting, and afterward for reimbursement etc.

> NIMBioS is the best organization for catalyzing great working meetings, bar none.

Working Groups: Feedback

"Many thanks to NIMBioS for the very efficient support and wonderful hospitality.

"The support was almost magical with food laid out just in time for breaks and a quick resettlement of our cancelled flights. The staff is amazing.

The most useful aspect of the working group:

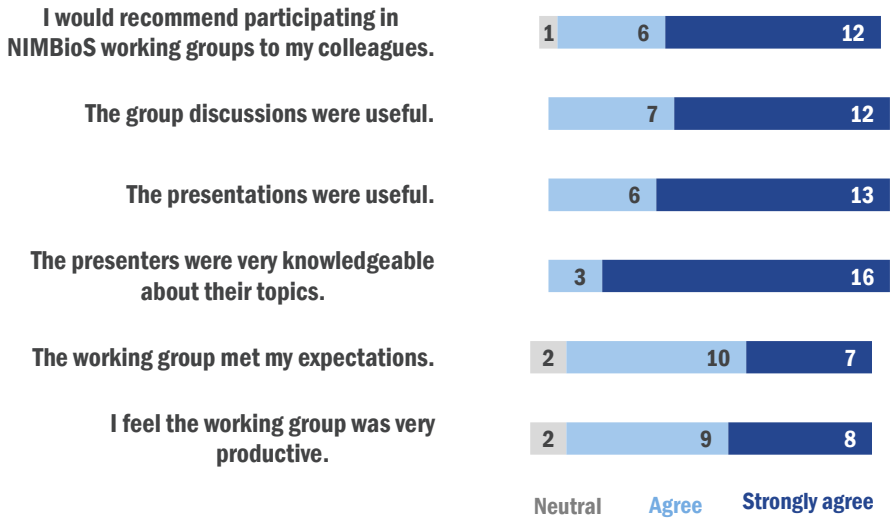
"Open discussion forum among a variety of expertise. Some truly new ideas came to me as a result. Very collaborative environment which means it was easy to think of new ideas. At the same time, very rooted in how to make this a self-sustaining effort. Very cool presentations which encouraged brainstorming and feedback.

Working group First Meetings

During RP 9, NIMBioS hosted the first meetings of three Working Groups, with a total of 29 participants. Evaluation surveys were sent to all participants. A total of 27 participants took part in the evaluation of the first meetings of their Working Groups. Eight of these participants were organizers and only answered questions about how they felt NIMBioS managed their events. (See http://www.NIMBioS.org/workinggroups/ for more details about specific Working Groups).

HIGHLIGHTS OF WORKING GROUP FIRST MEETING EVALUATION RESPONSES (FIGURES 20 TO 21).

Figure 20. Overall agreement with the content and format of the Working Group



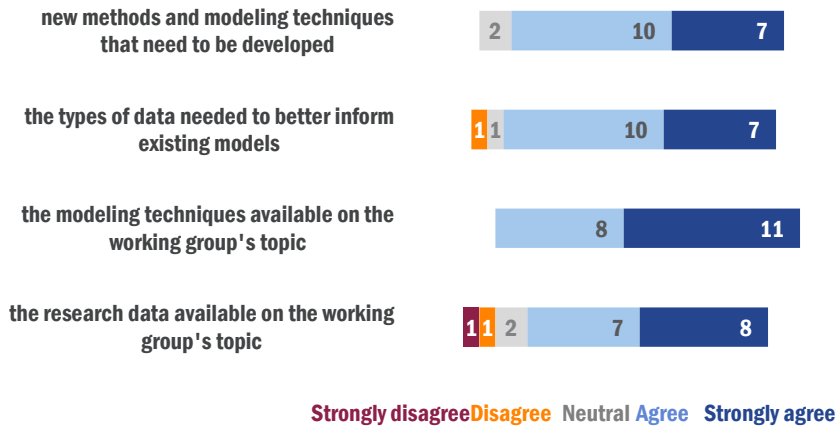
100% of participants indicated they had a better understanding of the research happening in the field in disciplines other than their own as a result of participating in this Working Group.

Working Groups: Feedback

"Whether these working groups result in joint research and publications or not, they are extremely productive because they allow plentiful opportunities for researchers with similar interests but complementary expertise to exchange ideas and formulate new problems and solutions, and not only pose questions, but also get answers.

"The meeting on January in NIMBioS was excellent and we have organized different tasks to be completed until the next meeting. I believe we are going in the good direction. Thanks NIMBIOS for giving us this opportunity.

Figure 21. Participants who felt the exchange of ideas during the Working Group would influence their future research:



Working Group Second, Third and fourth Meetings

During the reporting period, NIMBioS hosted the second meetings of three Working Groups, with 25 participants, the third meeting of six Working Groups, with 68 participants, and the fourth meeting of three groups, with 32 participants (Figure 18). 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, however, comments were solicited about the general feeling about the group's progress.

Concluded Working Groups

A total of 40 working groups having concluded with NIMBioS, with three Working Groups reaching their conclusions during the current reporting period (Figure 18). It is the policy of NIMBioS to send follow-up evaluation surveys to Working Group participants after the final meeting. A total of 247 participants from 32 Working Groups responded to the final evaluation for their groups.

Working Groups: Feedback

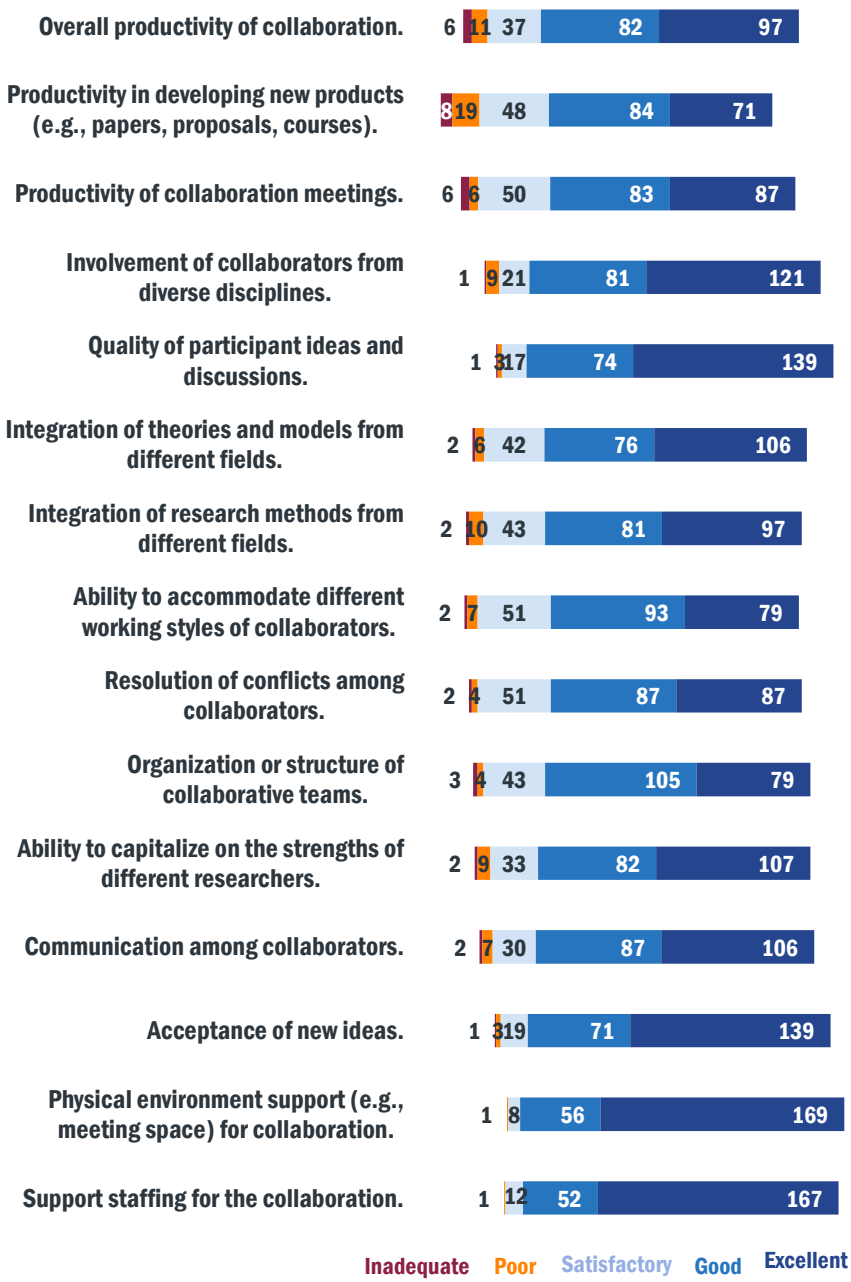
"NIMBioS support was fantastic, and provides an excellent and unique forum for interdisciplinary research to happen.

"A very stimulating intellectual environment

"It has been a great working environment, open, multi-methodological in principle (though data for the effort are not yet existing if not in very small cases) and great people to work with! Fun and productive, great meetings!

HIGHLIGHTS OF WORKING GROUP FOLLOW-UP EVALUATION RESPONSES (FIGURES 22 TO 24)

Figure 22. Evaluation of various aspects of Working Groups



Working Groups: Feedback

"I was very pleased with the way NIMBioS hosted us. This was a very stimulating meeting.

"This working group was very productive and it was a lot of fun working with everyone. I have continued collaborating with people from the working group even though the grant from NIMBioS has expired.

"I've participated in, led, or co-lead 5 WGs similar to Nimbios...some more applied, some not. First, UT, Knoxville, the hotel, and the facility are excellent...the best so far. Nimbios staff are also amazing and deserve much credit! The location, structure, and management of Nimbios sets a strong basis an effective team...it's by far the best place I've been to yet...

Figure 23. Evidence to support new insights and collaborations within the group

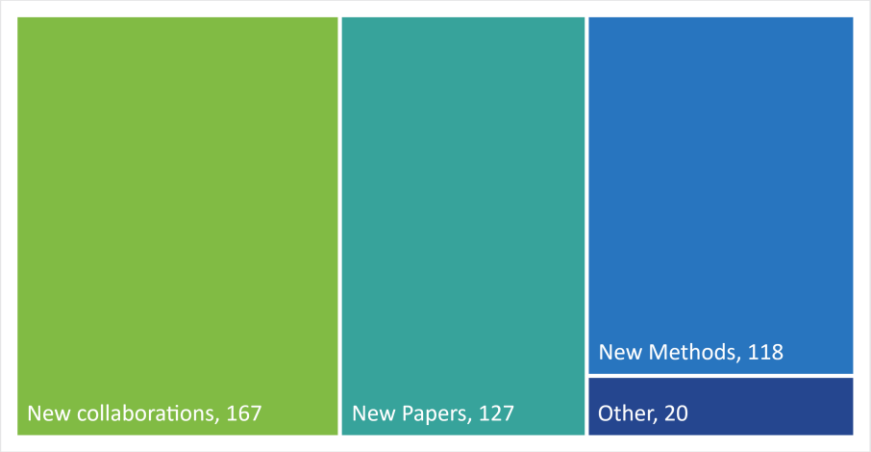
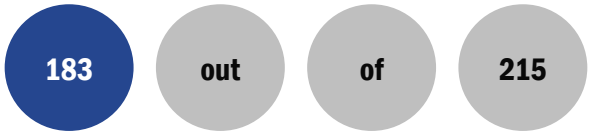
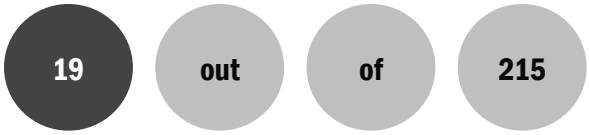


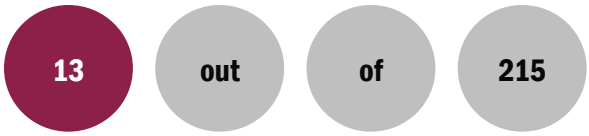
Figure 24. Overall satisfaction level with the Working Group



participants were very satisfied (*n* = 113) or satisfied (*n* = 70).



participants were neither satisfied or dissatisfied.



participants were dissatisfied (*n* = 9) or very dissatisfied (*n* = 4).

Investigative Workshops: Overall Summary

Number of Investigative Workshops supported by NIMBioS
42

Average attendance:
36
(*SD*=5)

Total participation:
1,532

Total unique participation:
1,377

Average meeting length:
2.9 days
(*SD*= .40)

INVESTIGATIVE WORKSHOPS

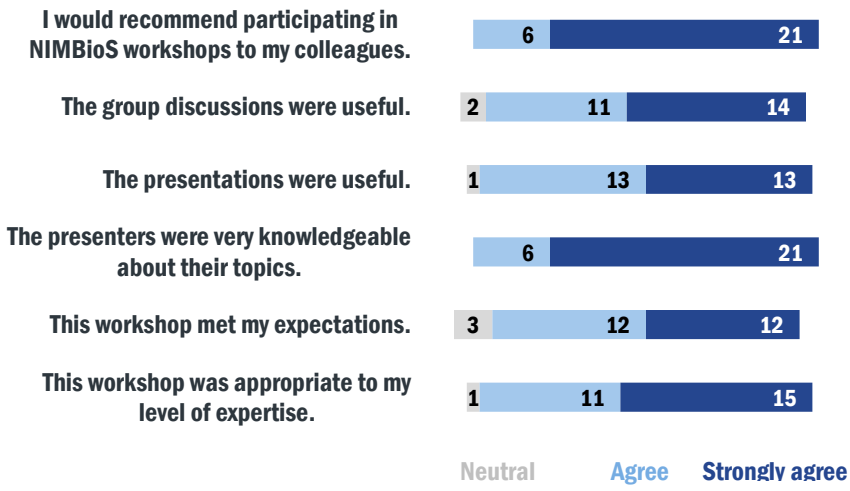
NIMBioS Investigative Workshops differ from Working Groups in that they focus on a broader topic or set of related topics at the interface of biology and mathematics and have relatively large size (30-40 participants). Workshops attempt to summarize/synthesize the state of the art and identify future 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 9 with a total of 32 on-site participants and 10 virtual participants (Figure 18). Evaluation surveys were sent to all on-site Workshop participants. A total of 30 participants took part in the evaluation of the Workshops.

HIGHLIGHTS OF WORKSHOP EVALUATION RESPONSES (FIGURES 25 TO 26)

100% OF ORGANIZERS WERE SATISFIED WITH HOW NIMBIOS HANDLED THE WORKSHOP!

Figure 25. Overall satisfaction with the content and format of the Workshop

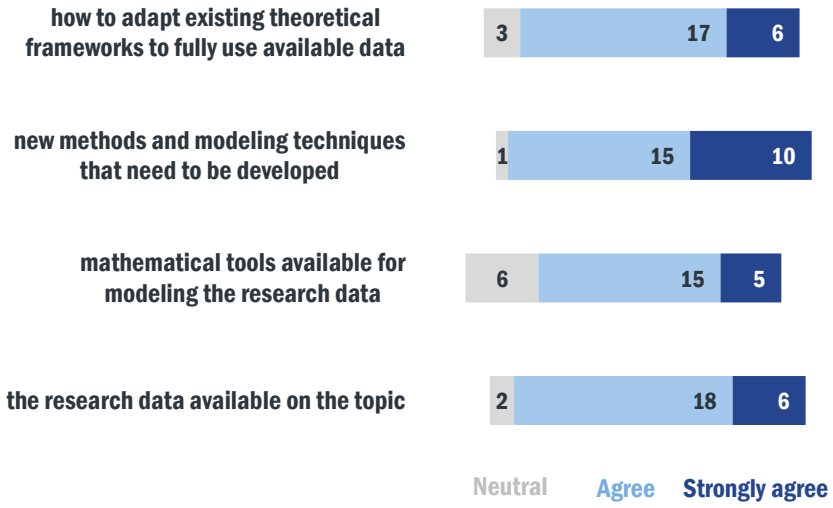


Workshop Feedback

"The diversity of participants was extremely helpful because we were able to consider a wide range of opinions and scientific experience and background.

"Best workshop I've participated in, and I'm mid- to late-career. I normally dislike small groups, and I'm not sure if I just got lucky but my group was terrific. Plus, Sean Hoban did a great job as coordinator/director. It was really a good use of my time, far more so than I ever expected.

Figure 26. Participant responses to the following question-- As a result of participating in this Workshop, I have a better understanding of:



EDUCATION AND OUTREACH PROGRAM ACTIVITIES

Tutorial

While NIMBioS has hosted a total of 20 tutorials, no tutorials have been hosted within the current AR9 period.

Tutorials: Overall Summary

Number of Tutorials supported by NIMBioS
20

Total unique participation:
573

Average attendance:
33

Average meeting length:
3.5 days
(*SD* = .40)

Total attendance:
654

16 out of 16

of SRE participants were very satisfied (n = 12) or satisfied (n = 4) with the research experience.

summer research experience

The NIMBioS Summer Research Experience (SRE) program took place on the University of Tennessee, Knoxville (UT) Knoxville campus June 06-July 29, 2016. Sixteen undergraduates were chosen to participate in the program. (While this SRE program technically fell within the dates of reporting period eight (RP 8), the SRE program for 2017 will not conclude until after the RP 9 annual report is due, so results from the previous year's SRE 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. Program organizers were Suzanne Lenhart (Dept. Mathematics/NIMBioS), and Kelly Sturner (NIMBioS).

The five research projects for the 2016 program included: 1) Using statistical filters to follow fast organelle movements in plant cells; 2) Dynamic modeling of human emotion; 3) Mouse trap! Modeling the spread of mice & hantavirus in pressured landscapes; 4) Decoding allostery by mathematical analysis of molecular dynamics simulations; and 5) Developing computer games for teaching biology.

CONTEXT

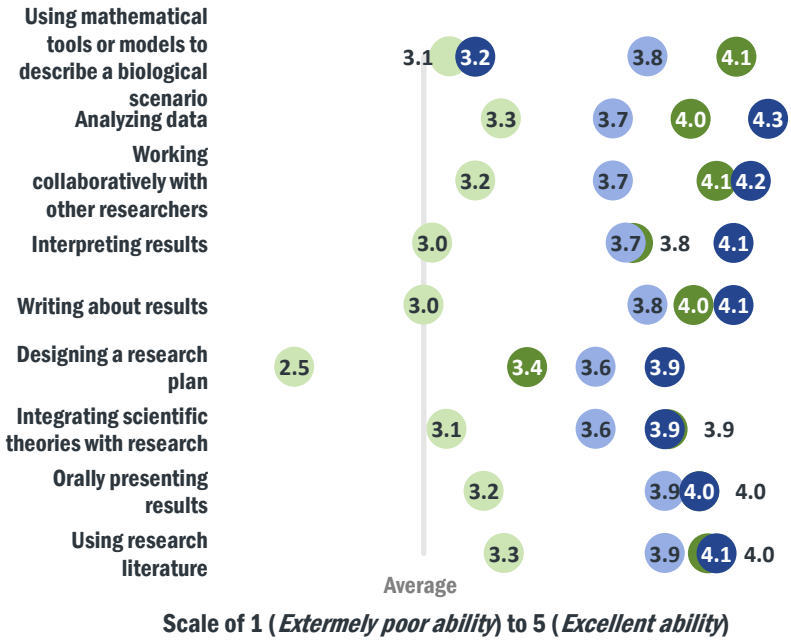
1. Participants will be satisfied with the program overall.
2. The research experience will meet participant expectations.
3. The research experience will impact participant plans to go to graduate school.
4. Participants will increase their research skills during the program.
5. Participant will feel 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.

HIGHLIGHTS OF SRE EVALUATION RESPONSES (FIGURES 27 TO 28)

SRE Feedback

"NIMBioS is not quite well known to my peers in my school (at least for me, I haven't ever heard of this until I searched online for stat/math/bio summer research program). This was such a great experience for meeting with people, and learning about research, and having fun! There's a pretty big bio department in my school so I'm pretty sure there would be plenty of people interested in this once they know there's such an institution that offers such a great summer experience.

Figure 27. Participant pre-and post-program skills as rated by SRE participants and Mentors. (Lighter colors indicate pre-scores and darker colors indicate post-scores.)



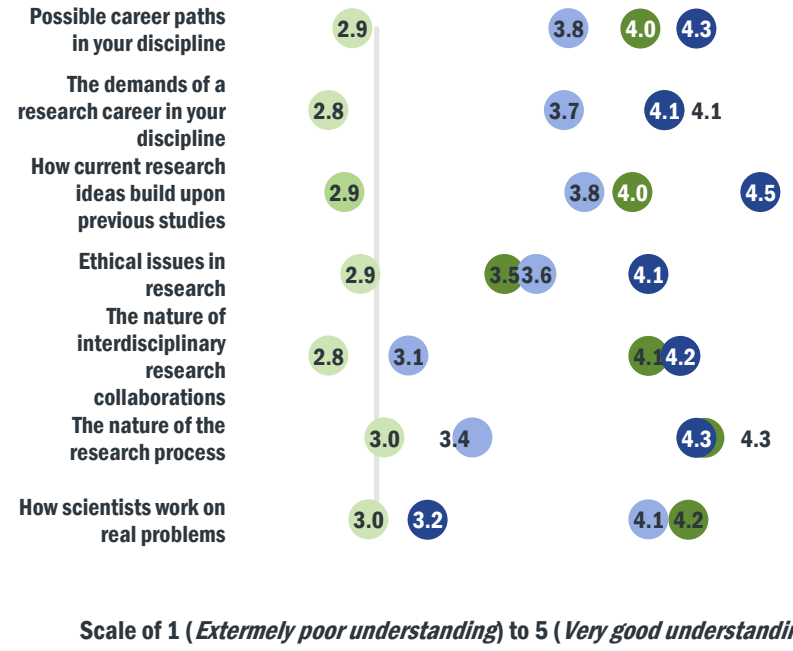


Figure 28. (above) Participant pre- and post-program knowledge as rated by SRE participants and Mentors. (Lighter colors indicate pre-scores and darker colors indicate post-scores.)

URC Feedback

"I enjoyed very much my first conference experience with NIMBioS. I got a lot of positive influences on my personal career plans and also my passion about doing research in math and biology.

"Overall, my experience was incredible and I am so grateful to have been able to fly to UT in order to present research that my team and I have been working on for months. I find research so fascinating and really loved that I got to participate in something like this.

"The meeting has never failed to meet my expectations as I attend from year to year.
And this year had been particularly rewarding because the students I came with appreciated the opportunity to share their work and mingle with other students doing great research.
It is my hope that this meeting will lead to future collaboration. (faculty)

Undergraduate Research Conference at the Interface of Biology and Mathematics (URC)

The NIMBioS seventh annual Undergraduate Research Conference at the Interface of Biology and Mathematics took place at the University of Tennessee's Conference Center in downtown Knoxville October 08-09, 2016. 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 Sturner.

A total of 83 participants (plus 2 organizers) attended the eighth annual Undergraduate Research Conference, which 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 event organizers. A total of 54 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.

HIGHLIGHTS OF URC EVALUATION RESPONSES (FIGURES 29 TO 30)

Figure 29. Respondent agreement levels with statements about various aspects of the conference for undergraduate and non-undergraduate participants.

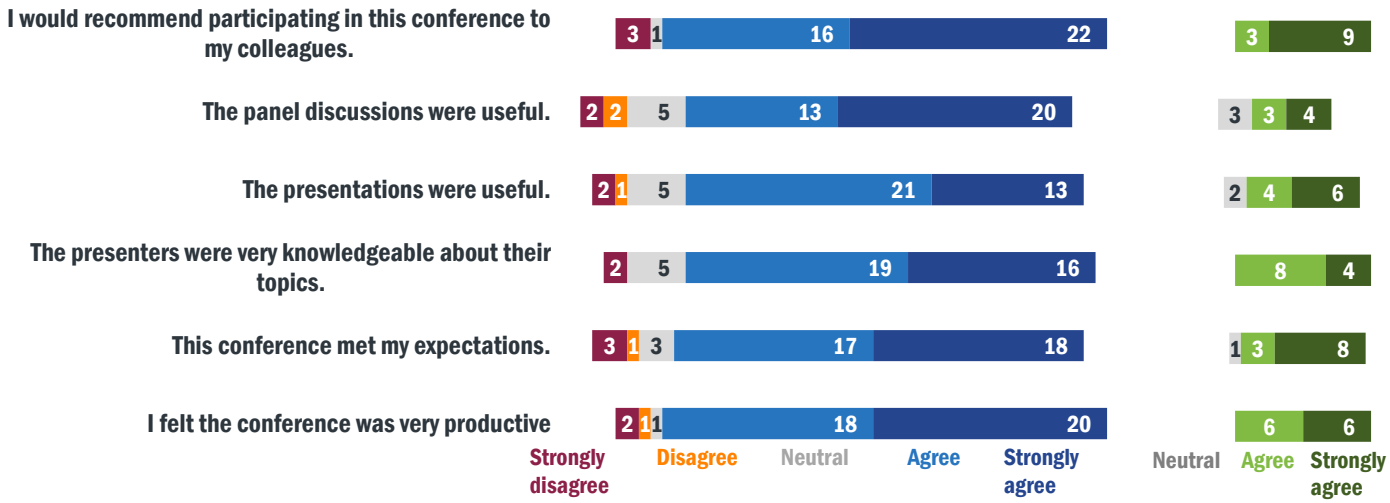
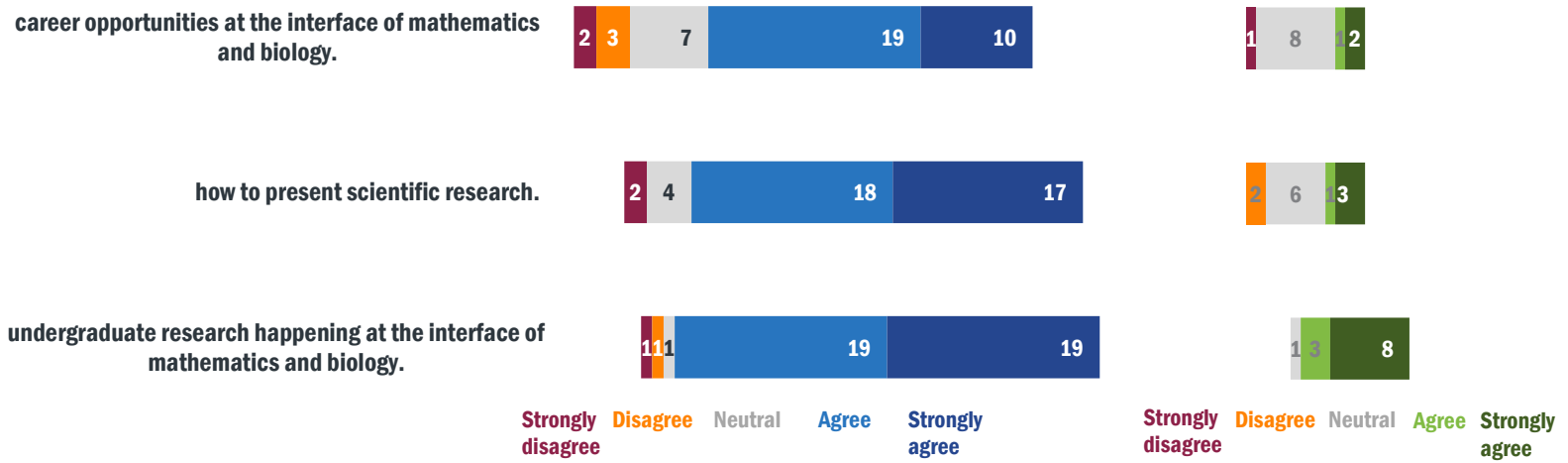


Figure 30. For undergraduate and non-undergraduate participants-- As a result of attending this conference, I have a better understanding of:



Postdoc Overall Summary

Postdoctoral alumni
39

Current postdocs
7

Average appointment:
1.91 years
(SD = 0.44)

NIMBIOS POSTDOCTORAL FELLOWSHIP PROGRAM

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 databases, and 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.

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.

Postdoc Feedback

"I had a wonderful experience at NIMBioS. The opportunity to interact with a large number of other postdocs and see them dealing with job interviewing etc., was a really great opportunity for me.

"Thank you for the amazing opportunity. It definitely made my career! I was able to do work I could do nowhere else. This remains the single most amazing part of NIMBioS- the synthesis and modeling work we do just doesn't have support elsewhere. The second most amazing is the support- job training, development, admin, and more. It was the best two years of science I've had so far!

"The NIMBioS postdoc program is fantastic and I feel so fortunate to have had the opportunity to grow there.

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, 34 (87%) alumni from the program have filled out the form.

HIGHLIGHTS OF POSTDOCTORAL FEL OWSHIP PROGRAM RESPONSES (FIGURES 31 TO 33)

Figure 31. Postdoctoral fellow satisfaction with program mentors

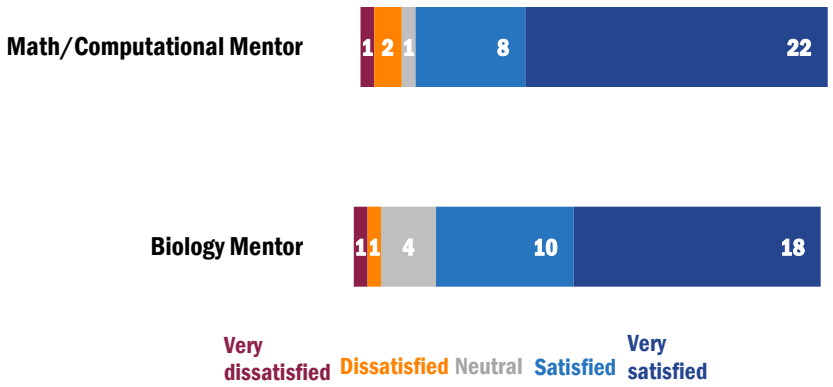
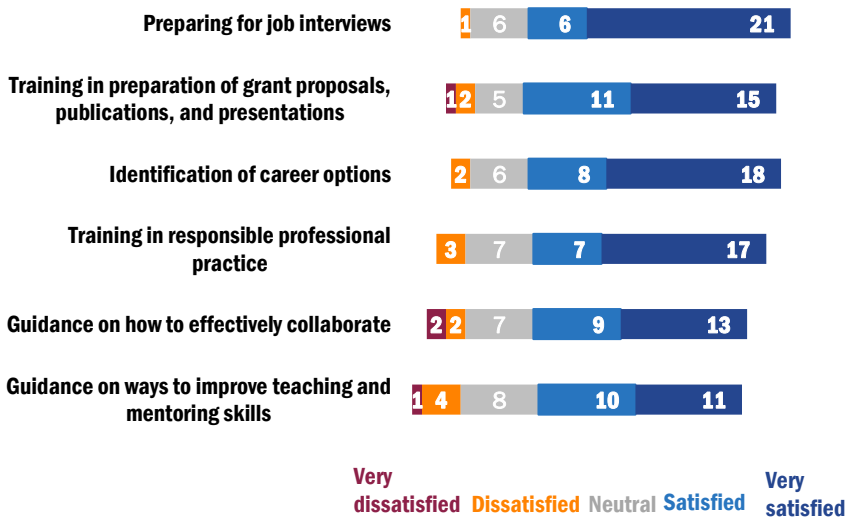


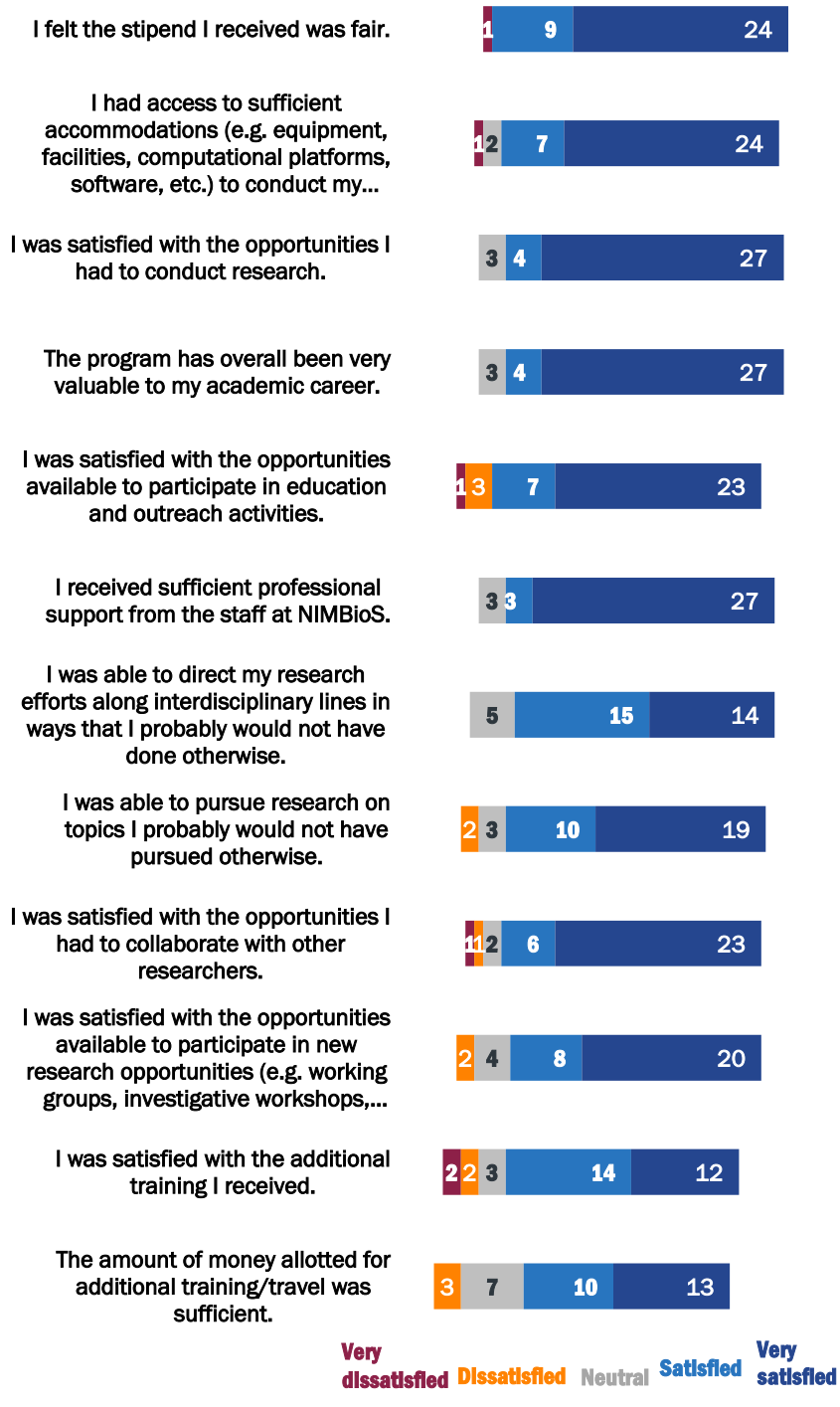
Figure 32. Postdoctoral fellow satisfaction with advice/assistance received from program mentors



Postdoc Feedback

"I was extremely impressed with the NIMBioS postdoctoral fellowship program. Paul Armsworth dedicated a tremendous amount of effort to facilitate our careers and build a strong collaborative network amongst the postdocs (including the alumni), and was a great role model for all of us. Whether he realized it or not, we took note of how productive Paul was and tried to change our habits to become more effective and efficient workers. Having such a high-energy, collaborative, and diligent group of postdocs was inspiring. We would often have a healthy level of competition among each other, and would encourage each other to meet new challenges. Some postdocs were not as sociable as others, but overall it was a great group to learn from and colleagues that I hope I interact with in the future. Thanks to the NIMBioS leadership team and staff for everything that they did! I cannot thank them enough for going above and beyond the call of duty to foster the growth of the postdocs and build a supportive and collegial work environment among the entire NIMBioS community.

Figure 33. Postdoctoral fellow satisfaction with overall program experience



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

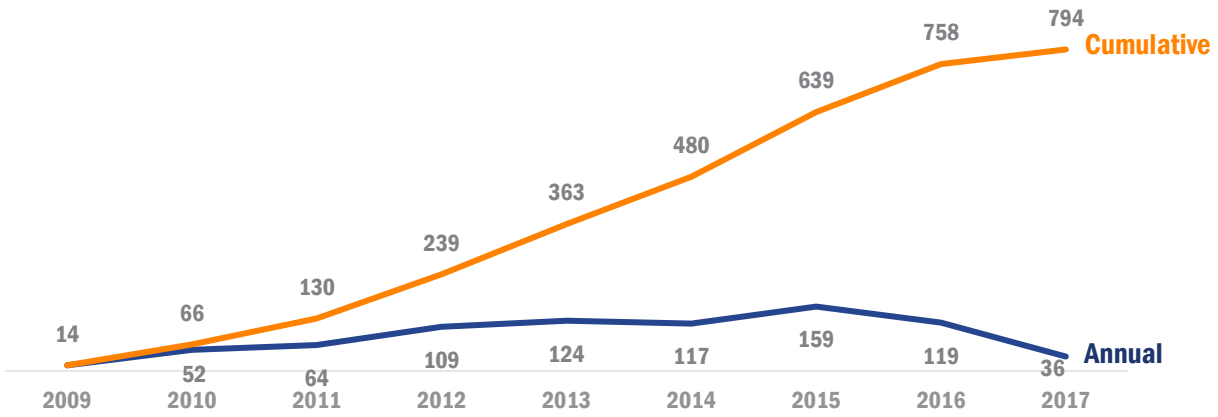
1. NIMBioS publications will be highly interdisciplinary.
2. NIMBioS publications will be highly cited.
3. NIMBioS publications will highly collaborative.
4. NIMBioS participants will produce other scholarly products, including book chapters, presentations, proposals for follow-on research, meetings/Workshops,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

PUBLICATIONS

Activities at NIMBioS have led to 794 published journal articles on a range of subjects from January 2009- April 2017, (**Figures 34 to 35** and **Table 1**). An additional eight are in press at writing and 16 have been submitted for review. The articles cover research ranging across many areas of ecology, evolutionary biology, applied mathematics, and computational biology.

Figure 34. Most common words from NIMBioS publication abstracts, all years

Figure 35. Number of cumulative and annual publications reported from NIMBioS activities since 2009, by publication year



Note. 2017 includes publications submitted by participants to NIMBioS through April 2016

NIMBioS products are published in many high-ranking journals in their respective fields. Table 1 highlights the number of products in a selection of high-impact journals according to the Web of Science impact factor. Prominent high impact journals include Nature, Cell, Science, Ecology Letters, and Trends in Ecology and Evolution.

NIMBioS publications come from a variety of activities, although Working Group participants tend to publish the largest portion of journal articles (29%), followed by NIMBioS Postdoctoral Fellows (27%) (Figure 36).

Figure 36. Distribution of journal publications submitted to NIMBioS by participants

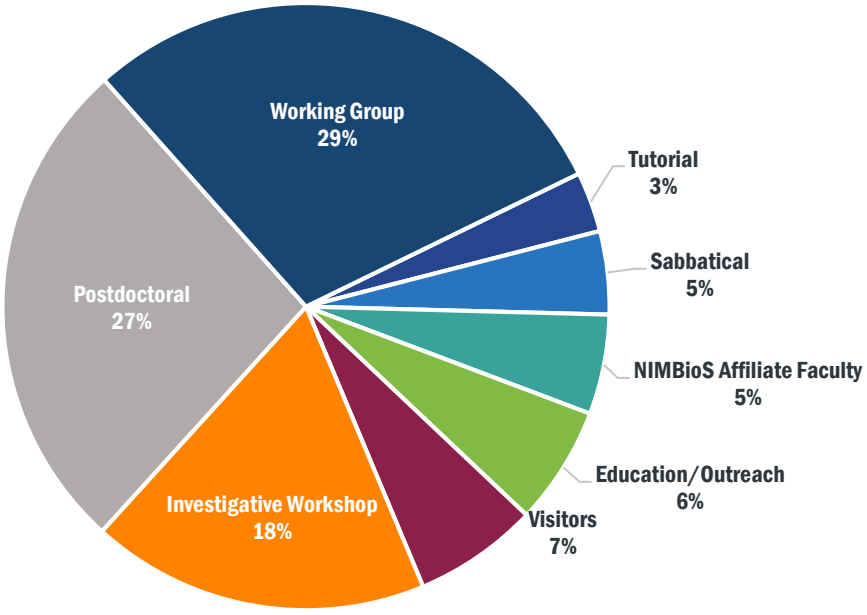


Table 1. Number of NIMBioS articles published in a selection of high-impact journals during the current reporting period (through April 2016) and since NIMBioS' inception, sorted by journal 5-Year Impact Factor

Journal Title	5-Year Impact Factor *	# of NIMBioS Publications in Year 9 **	# of NIMBioS Publications Since Inception ***
Nature	41.46	0	5
Cell	32.86	0	1
Science	34.92	1	8
Trends in Ecology and Evolution	19.42	0	7
Ecology Letters	14.94	1	11
Systematic Biology	15.27	0	7
PLoS Biology	10.73	0	3
Nature Communications	12.00	0	2
Proceedings of the National Academy of Sciences	10.29	3	19
Current Biology	9.73	0	1
PLoS Genetics	7.48	0	2
Nucleic Acids Research	8.65	0	3
Phil Trans of the Royal Soc B-Biological Sciences	7.22	1	7
Molecular Ecology	6.23	1	11
Ecology	5.98	1	7
Proc of the Royal Soc B-Biological Sciences	5.366	2	12
PLoS Computational Biology	5.12	0	8
Evolution	4.37	0	17
Journal of Animal Ecology	5.25	0	4
American Naturalist	4.13	0	13
Journal of the Royal Society Interface	4.41	0	5
PLoS One	3.54	1	36
Animal Behaviour	3.28	0	9
BMC Bioinformatics	3.44	0	2

* 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).

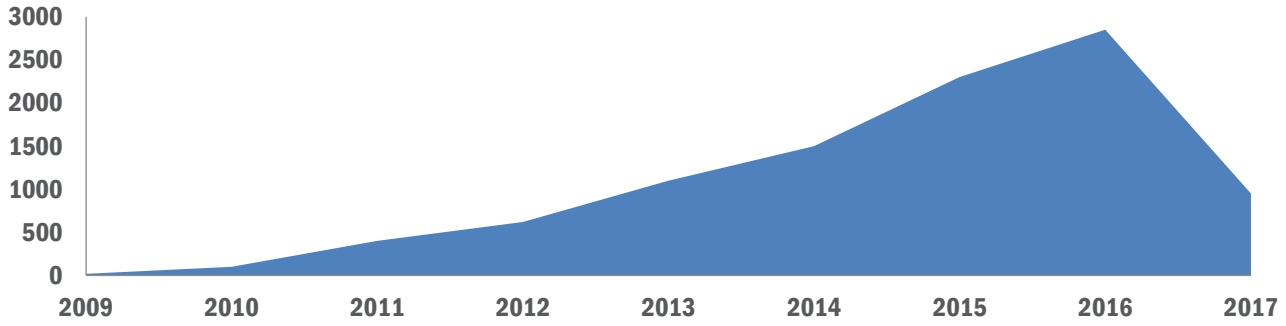
** Number of publications in Year 9 includes all publications reported since compilation of the previous Annual Report (April 2015) through April 2017.

*** September 2008 – April 2017

Bibliometric Indicators

CITATION ANALYSIS OF PUBLICATIONS. Of the 794 journal articles reported by NIMBioS participants, 719 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 2,210 researchers from 819 unique institutions spanning 57 countries. These articles have appeared in 269 different journals, many of which are considered to have high-impact in the academic community. These articles have been collectively cited 9,991 times, with an average of 13.92 cites per article, and an h-index of 43 (Figure 37). The cites per article falls within the range of the two major research fields of the publications during the last 10 years; mathematics (4.14 citers/paper) and biology (16.91 cites/paper). Eighty-five participants have authored five or more papers each as a result of NIMBioS affiliated collaborations.

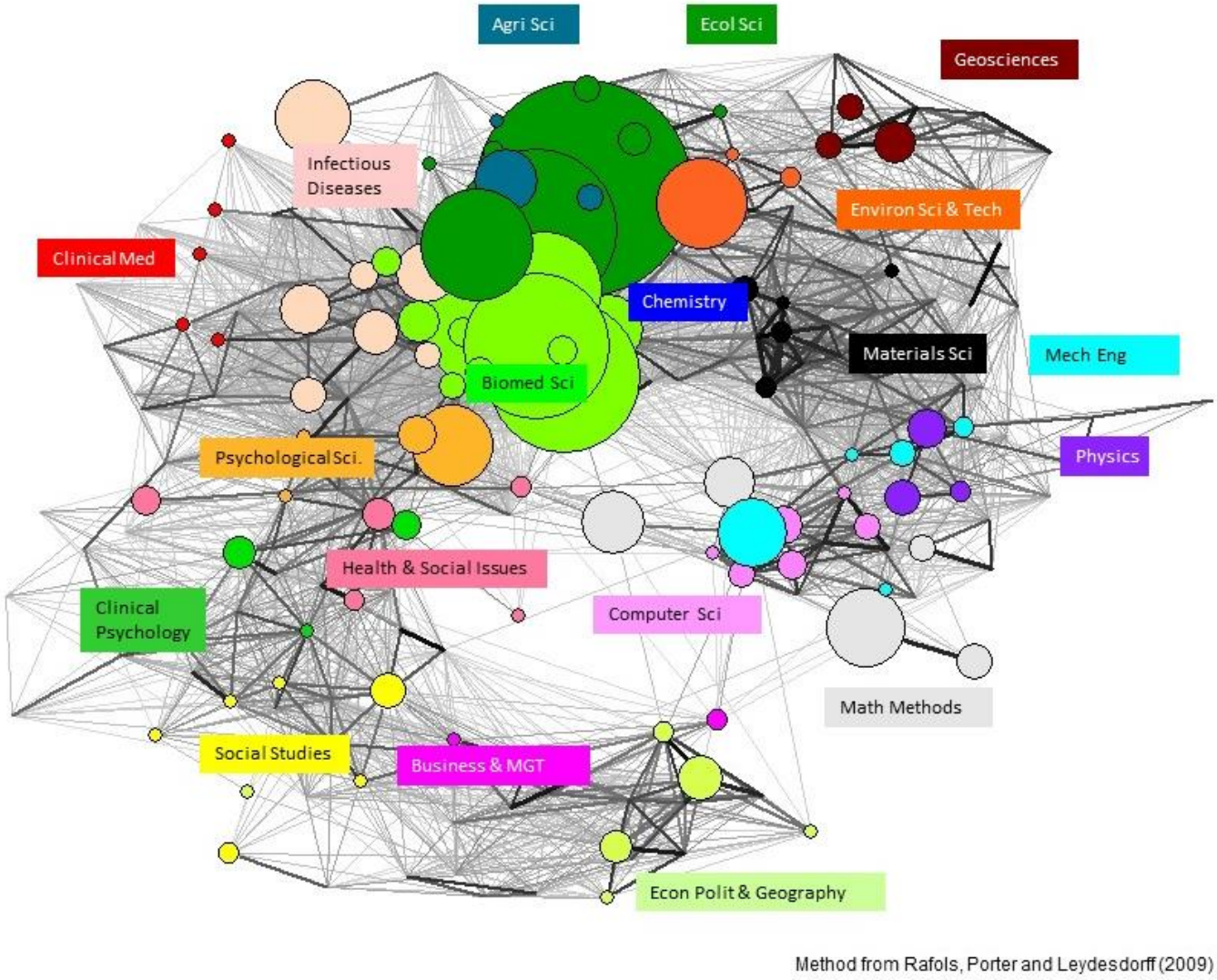
Figure 37. Citations per year for NIMBioS articles



DISCIPLINARY SPAN OF PUBLICATIONS. The 719 published articles in WOS span 104 discipline areas, as designated by the ISI WOS Categories. 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.

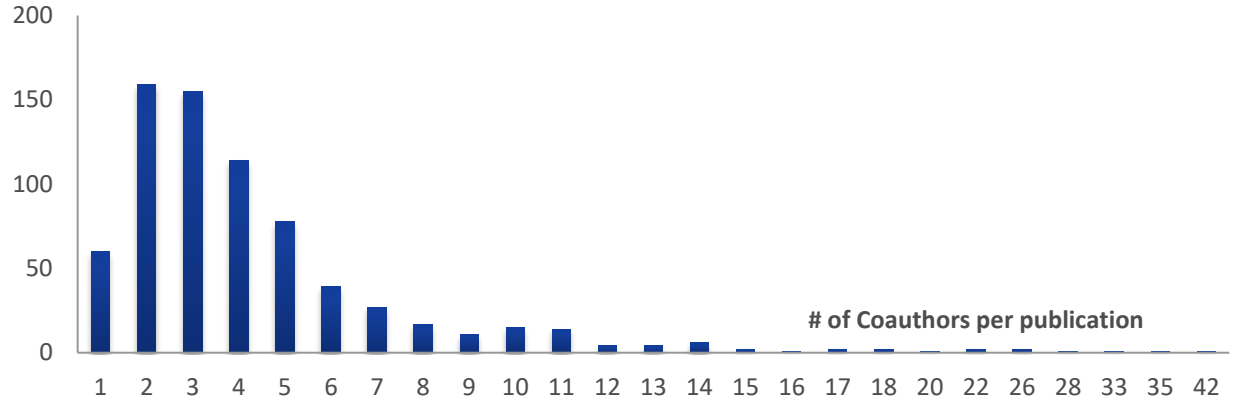
Figure 38 locates the subject categories of the 719 NIMBioS articles on a network map of the WOS Categories. The gray background intersections are the 224 WOS Categories, located based on cross-citation relationships among all WOS journals in 2007 (from Rafols, Porter, and Leydesdorff, 2009). The 19 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. The most common subject category in which NIMBioS publications fell was Ecology (204), followed by Evolutionary Biology (14), Biology (103), Mathematical & Computational Biology (100), Multidisciplinary Sciences (92), and Genetics & Heredity (58).

Figure 38. Web of Science categories for 719 WoS journal articles to date



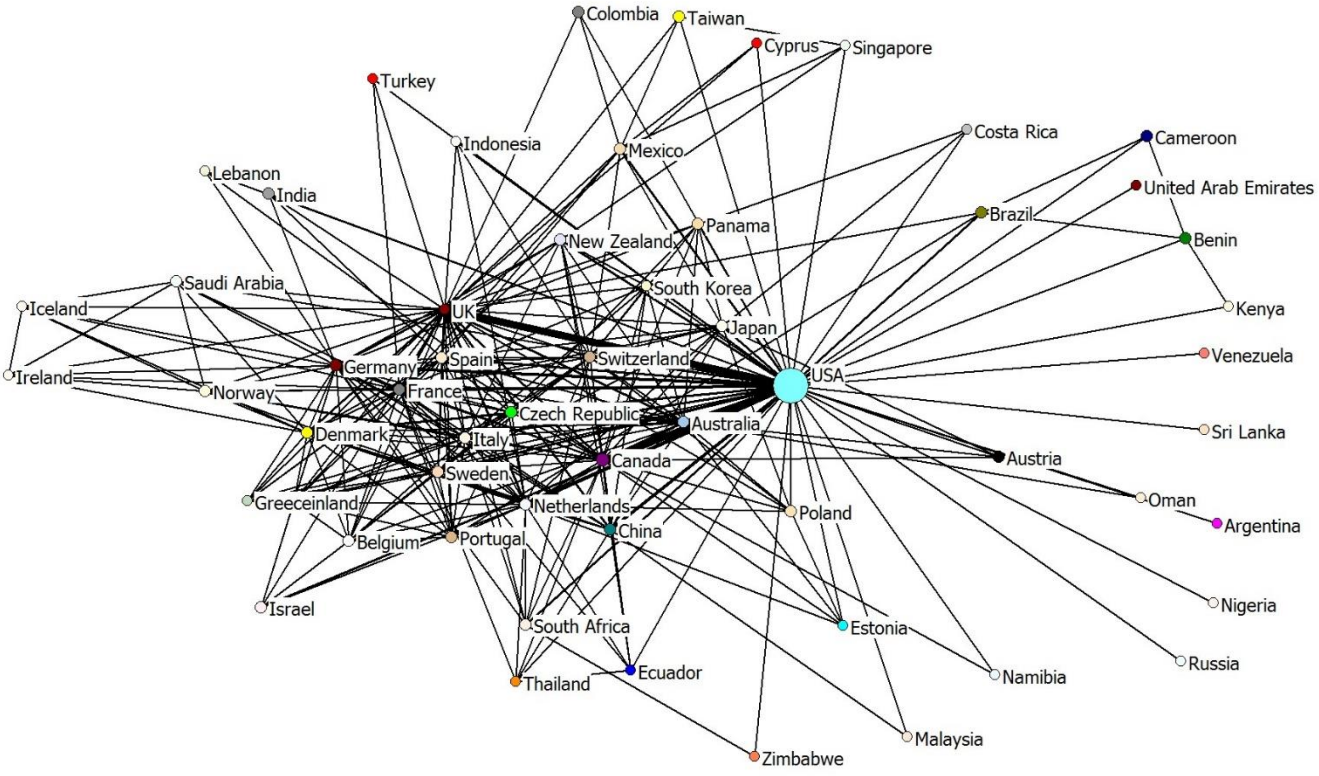
COAUTHORSHIP. One of the core values of NIMBioS is to take a collaborative approach to science and science education. We are interested, therefore, in examining the number of co-authors on NIMBioS-related publications as one indicator of scientific collaboration. For the 719 publications reported thus far, the average number of co-authors per paper is 4.5 (Figure 39).

Figure 39. Coauthorship frequency of NIMBioS publications



INTERNATIONAL COAUTHORSHIP. NIMBioS also fosters international collaboration among researchers. While 57 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 1-12 countries represented per paper (**Figure 40**).

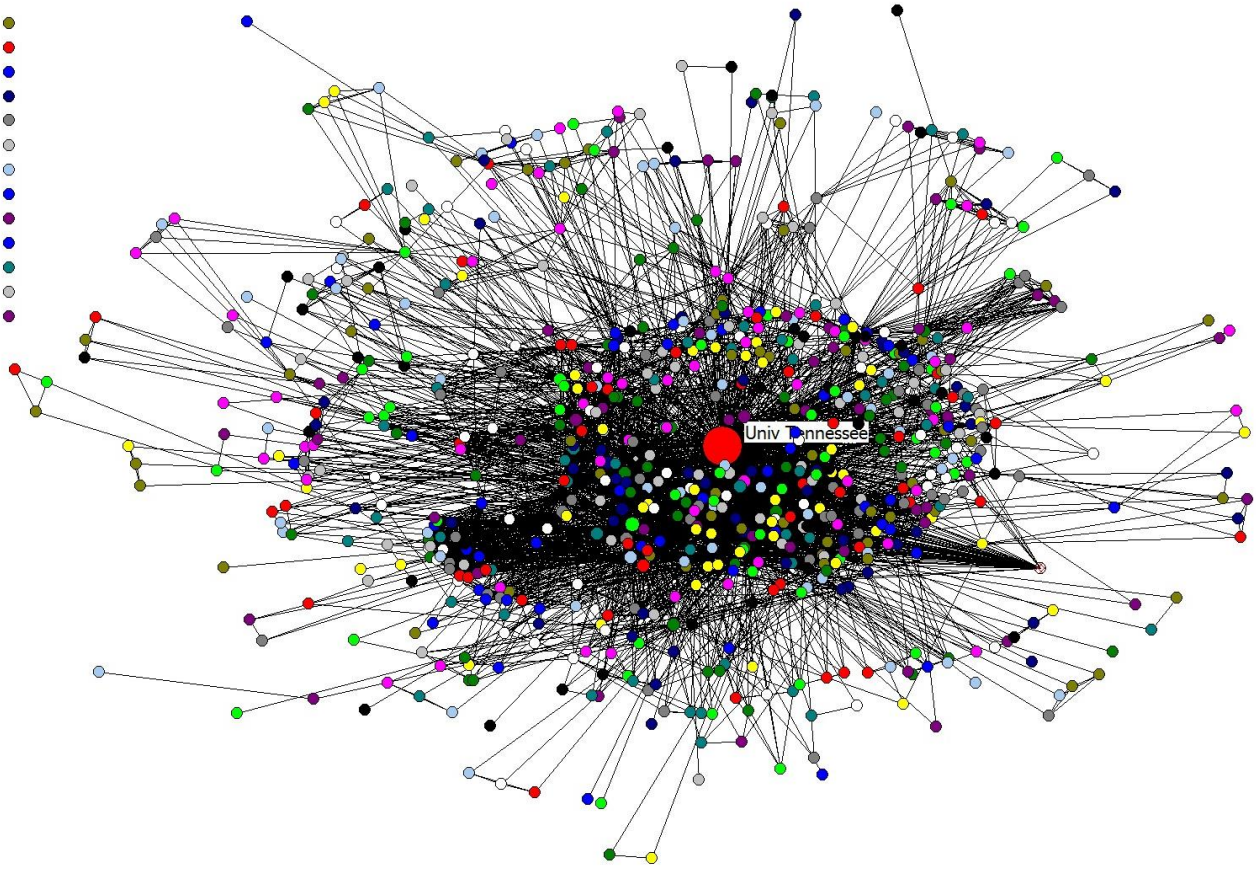
Figure 40. International collaboration on NIMBioS publications



Note. 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.

CROSS-INSTITUTIONAL COAUTHORSHIP. Coauthors of NIMBioS publications through the current reporting period came from 819 unique institutions **(Figure 42)**. The average number of institutions represented per paper was 3.4, with a range of 1-35 institutions per paper.

Figure 41. Cross-institutional collaboration of NIMBioS publications

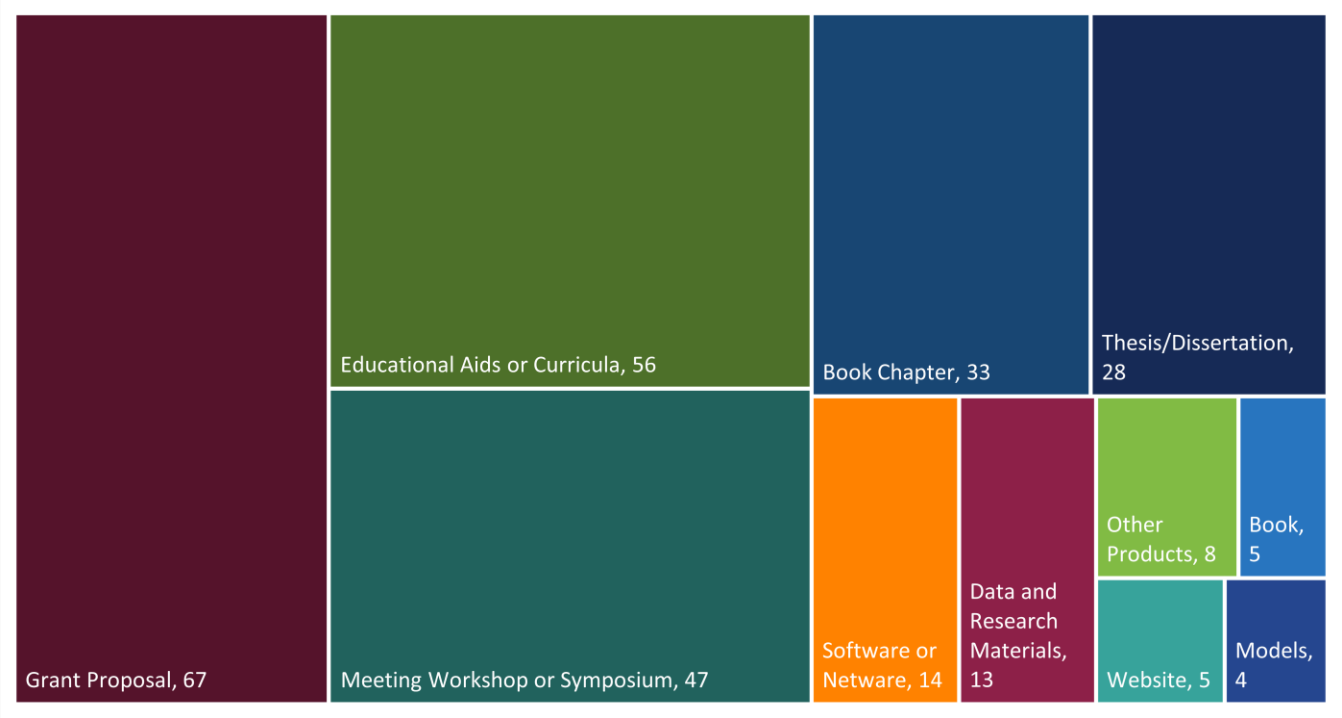


Note. Node radius represents the log scaled number of NIMBioS-affiliated papers from each institution, and line size represents the number of collaborations among institutions on these papers. Only 13 of the 819 institutions represented have published single-institution papers. The University of Tennessee is at the center of the graph.

OTHER SCHOLARLY PRODUCTS

In addition to journal publications, participants report other types of products that have resulted from their activities at NIMBioS. **Figure 43** summarizes these types of products for the nine-year period. In addition to the items listed in Figure 43, NIMBioS participants have reported 858 conference presentations related to NIMBioS affiliation.

Figure 42. Number of non-journal publication products arising from NIMBioS events



Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-3. Participant List for NIMBioS Events and Activities

Modeling Organisms-to-Ecosystems WG M3 9/26/2016

Bjorn	Birnir	Invited
Randall	Bruins	Invited
Virginie	Ducrot	Invited
Valery	Forbes	Organizer
Nika	Galic	Invited
Kristina (Kris)	Garber	Invited
Henriette (Yetta)	Jager	Invited
Andrew	Kanarek	Invited
Roger	Nisbet	Invited
Robert	Pastorok	Invited
Steven	Railsback	Invited
Richard	Rebarber	Invited
Christopher	Salice	Organizer
Perrnille	Thorbek	Invited

Teaching Quantitative Bio WG M3 10/6/2016

Hannah	Callender	Invited
Kam	Dahlquist	Invited
Joe	Dauer	Invited
Sam	Donovan	Organizer
Carrie	Eaton	Organizer
Gregory	Goins	Invited
Kristin	Jenkins	Organizer
John	Jungck	Invited
Michael	LaMar	Organizer
Glenn	Ledder	Invited
Richard	Schugart	Invited

Undergraduate Research Conference (URC) 2016 10/8/2016

Folashade	Agusto	Open
Aleah	Archibald	Open
Drew	Bellows	Open
Sharee	Brewer	Open
Kelly	Buch	Open
Myson	Burch	Open
Daniel	Carrillo	Open
Stefano	Chiaradonna	Open
Deidra	Coleman	Open
Alana	Cooper	Open
Joshua	Darville	Open

Judy	Day	Invited
Katerina	Douglas	Open
Jerry	Duran	Open
Igor	Erovenko	Open
Arietta	Fleming-Davies	Open
Dustin	Ford	Open
Elizabeth	Franko	Open
Rachel	French	Open
Leslie	Fuentes	Open
Alanna	Gary	Open
Josias	Gomez	Open
Miranda	Goodman	Open
Louis (Lou)	Gross	Invited
Mallory	Harris	Open
Emily	Horton	Open
Marianne	Hull	Open
Morganne	Igoe	Open
Tiffany	Jann	Open
Gregory	Javens	Open
Nels	Johnson	Invited
Arjun	Kanthawar	Open
Claudia	Kassouf	Open
Ruby	Kim	Open
Nikhil	Krishna	Open
Howsikan	Kugathasan	Open
Tequania	Lake	Open
Jacquelyn	Lane	Open
Austin	Lawson	Open
RaQuedra	Lee	Open
Tyler	Lee	Open
Suzanne	Lenhart	Open
Qingxia	Li	Open
Zhengqing	Liu	Open
Jacob	Menix	Open
Jocelyn	Moore	Open
Juan	Moreno	Open
Christina	Mortensen	Open
Sarah	Oldfield	Open
Nasir	Omar	Open
Demisha	Porter	Open
Ayush	Prasad	Open
Christopher	Pritchard	Open
Sarah	Rainey	Open

Kelly	Reagan	Open
Eli	Renfro	Open
Abigail	Rich	Open
Arriana	Rieland	Open
Sarah	Robinson	Open
Lynnette	Robinson	Open
Elizabeth	Rodriguez	Open
Cody	Rogers	Open
Jonathan	Rowell	Open
Diane	Sanborne	Open
Richard	Schugart	Open
Jamshaid	Shahir	Open
Theresa	Sheets	Open
Jonathan	Stetler	Open
Deonte	Straks	Open
Kelly	Sturner	Organizer
Tayor	Swett	Open
Rachel	Timm	Open
Jiah	Toms	Open
Kimberly	Truong	Open
Rachel	Turner	Open
Laura	Vaughan	Open
Jorge	Velasco-Hernandez	Invited
Albrecht	von Arnim	Open
Rebekah	Wagner	Open
Bryan	Wallace	Open
William	Wang	Open
Jonathan	Waring	Open
Laurel	Woodward	Open
Jacob	Worrell	Open
Zhimin	Wu	Open

Remotely Sensing Biodiversity WG M2 10/11/2016

Jeannine	Cavender-Bares	Organizer
John	Gamon	Invited
Jose Eduardo	Meireles	Organizer
Brian	O'Meara	Organizer
Franziska	Schrodt	Invited
Anna	Schweiger	Invited
Philip	Townsend	Organizer
Susan	Ustin	Invited

BoA Meeting Oct. 2016 10/19/2016

Linda	Allen	Remote
Lydia	Bourouiba	Remote
Ernest	Brothers	Invited
Zhilan	Feng	Remote
Sergey	Gavrilets	Invited
John	Glasser	Remote
Colleen	Jonsson	Invited
Simon	Kahan	Remote
Jacob	LaRiviere	Invited
Suzanne	Lenhart	Invited
Mark	Lewis	Remote
Mark	McPeek	Remote
Claudia	Munoz-Zanzi	Remote
Brian	O'Meara	Invited
Peter (Pete)	Richerson	Remote
Rayna (Raina)	Robeva	Invited
Talitha	Washington	Remote
Chris	Welsh	Invited

Spatial Cell Simulations WG M3 10/19/2016

James	Faeder	Organizer
Margaret	Johnson	Invited
Carlos	Lopez	Remote
Ion	Moraru	Invited
Robert	Murphy	Organizer
Julie	Theriot	Remote
Adelinde	Uhrmacher	Invited

Caulobacter Cell-Cycle Model WG M1 10/20/2016

Kim	Blackwell	Invited
Yang	Cao	Organizer
Sean	Crosson	Invited
Aretha	Fiebig	Invited
Srividya	Iyer-Biswas	Organizer
Hye Won	Kang	Invited
Kartik	Subramanian	Invited
John	Tyson	Organizer
Shari	Wiley	Invited

Blackwell-Tapia Conference and Awards Ceremony 10/28/2016

Adeniran	Adeboye	Open
Folashade	Agusto	Open
Saud	Aldosary	Open
Vasilios	Alexiades	Open
Leyda	Almodovar Velazquez	Open
Alejandra	Alvarado	Open
Phillip	Andreae	Open
Federico	Ardila	Invited
Javier	Arsuaga	Open
Sarder	Asaduzzaman	Open
Ibrahim	Aslan	Open
Alexander	Barrios	Open
Ghan	Bhatt	Open
Danielle	Burton	Open
Carlos	Castillo-Chavez	Open
zheng	chen	Open
Tamara	Christiani	Open
Ariel	Cintron-Arias	Open
Cory	Colbert	Open
Irma	Cruz-White	Open
Kathryn	Dabbs	Open
Kyle	Dahlin	Open
Judy	Day	Open
Mahir	Demir	Open
Christina	Edholm	Open
Kossi	Edoh	Open
David	Eisenbud	Open
Mustafa	Elmas	Open
Nina	Fefferman	Open
Arturo	Fernandez	Open
Yessica	Gaitan	Open
Edray	Goins	Invited
Louis (Lou)	Gross	Open
Helen	Grundman	Open
Michelle	Guinn	Open
Johnny	Guzman	Invited
Brendan	Hassett	Open
Sanjukta	Hota	Open
Jacqueline	Hughes-Oliver	Open
Monica	Jackson	Invited
Marie	Jameson	Open
Colleen	Jonsson	Open

Hem	Joshi	Open
Germaine	Kamleu Ndouma	Open
Oumar	Karaga	Open
Michael	Kelly	Open
Isabelle	Kemajou-Brown	Open
David	Kotval	Open
Taylor	Lashley	Open
Ladorian	Latin	Open
Addie	Ledbetter	Open
Suzanne	Lenhart	Organizer
Elizabeth	Lewis	Open
Thomas	Lewis	Open
Joan	Lind	Open
Caroline	Maher-Boulis	Open
Andrew	Marchese	Open
Vasileios	Maroulas	Open
Reginald	McGee	Open
Francis	Medina	Open
Luis	Melara	Open
Ornik	Melkior	Open
Tadele	Mengesha	Open
Joshua	Mike	Open
Jillian	Miller	Open
Jemal	Mohammed-Awel	Open
Carolyn	Morgan	Invited
Jami	Mulgrave	Open
Cheryl	Murphy	Open
David	Murrugarra	Open
Bikki	Nagarkoti	Open
Calistus	Ngonghala	Open
Grace	Ngunkeng	Open
Asamoah	Nkwanta	Invited
Eric	Numfor	Open
Kamaldeen	Okuneye	Open
Saulo	Orizaga	Open
Jenda	Overtoun	Invited
Wanda	Payne	Open
Jean-Claude	Pedjeu	Open
Jose	Perea	Invited
Georgios	Petridis	Open
Arlie	Petters	Open
Conrad	Plaut	Open
Joan	Ponce	Open

Candice	Price	Open
Nar	Rawal	Open
Camila	Reyes	Open
Vanessa	Rivera-Quinones	Open
George	Santellano	Open
Omar	Saucedo	Open
Athmanathan	Senthilnathan	Open
Scott	Sherry	Open
Nourridine	Siewe	Open
Robert	Stolz	Open
Kelly	Sturner	Organizer
De Witt	Sumners	Invited
Richard	Tapia	Invited
Sergei	Tarasov	Open
Wencel	Valega	Open
Mariel	Vazquez	Invited
Maria Cristina	Villalobos	Invited
Yiyuan	Wang	Open
Talitha	Washington	Open
Nathaniel	Whitaker	Open
Julius	White	Open
Jessica	Williams	Open
Shawn	Witte	Open
Abdul-Aziz	Yakubu	Invited

Leptospirosis Modeling WG M4 11/1/2016

Zhilan	Feng	Remote
Matthew	Gompper	Invited
Rudolf (Rudy)	Hartskeerl	Invited
Vincent	Herbreteau	Remote
Suzanne	Lenhart	Invited
Claudia	Munoz-Zanzi	Organizer
Suzanne	O'Regan	Invited
Andrea	Previtali	Invited
Elizabeth	Santiago	Invited
Maria Cristina	Schneider	Invited
Jorge	Velasco-Hernandez	Organizer

Next Generation Genetic Monitoring WS 11/7/2016

Sally	Aitken	Open
Kimberly	Andrews	Open

Eric	Archer	Open
Mark	Beaumont	Invited
Louis	Bernatchez	Organizer
Michael	Bruford	Organizer
Emma	Carroll	Invited
Anne	Chao	Invited
J.	DeWoody	Invited
Christine	Edwards	Invited
Daniel	Faith	Open
Anne-Laure	Ferchaud	Open
Sarah	Flanagan	Open
Brenna	Forester	Open
Marie-Josee	Fortin	Invited
Oscar	Gaggiotti	Invited
Jerome	Goudet	Open
Brian	Hand	Invited
Sean	Hoban	Organizer
Margaret	Hunter	Invited
Lou	Jost	Open
Elizabeth	Kierepka	Open
Emily	Latch	Open
Gregoire	Leroy	Invited
Brook	Milligan	Open
Pedro	Peres-Neto	Open
Christopher	Richards	Invited
Cornman	Robert	Invited
Allan	Strand	Invited
Lisette	Waits	Open
Jinliang	Wang	Open
Robin	Waples	Invited
Juan Manuel	Aguilar Leon	Virtual Participant
Jose Luis	Blanco Pastor	Virtual Participant
Nick	Deacon	Virtual Participant
Rachael	Giglio	Virtual Participant
Matthew	Iacchei	Virtual Participant
Lua	Lopez Perez	Virtual Participant
Gordon	Luikart	Virtual Participant
Pablo	Orozcoter Wengel	Virtual Participant
Octavio	Paulo	Virtual Participant
Noah	Reid	Virtual Participant

Ecological Network Dynamics WG M3 11/14/2016

Marcus	Aguiar	Invited
Laura	Burkle	Invited
Marie-Josee	Fortin	Invited
Dominique	Gravel	Organizer
David	Hembry	Organizer
Nels	Johnson	Invited
Ulrich	Mueller	Remote
Erica	Newman	Invited
James (Jimmy)	O'Donnell	Organizer
Mathias	Pires	Invited
Timothee	Poisot	Invited
Justin	Yeakel	Invited

Modeling Molecules-to-Organisms WG M3 11/29/2016

Philipp	Antczak	Invited
Natalia	Garcia-Reyero	Invited
Andre	Gergs	Invited
Dina	Lika	Invited
Terry	Mathews	Invited
Erik	Muller	Invited
Cheryl	Murphy	Organizer
Diane	Nacci	Invited
Roger	Nisbet	Organizer
Christopher (Chris)	Remien	Invited
Irvin	Schultz	Invited
Karen	Watanabe	Invited

Prediction and Control of Cardiac Alternans WG M2 12/14/2016

Elizabeth	Cherry	Invited
Flavio	Fenton	Invited
Roman	Grigoriev	Invited
Trine	Krogh-Madsen	Invited
Laura	Munoz	Invited
Alena	Talkachova	Organizer
Xiaopeng	Zhao	Organizer
Sharon	Zlochiver	Invited

Multiscale Vectored Plant Viruses WG M3 12/19/2016

Linda	Allen	Organizer
Vrushali	Bokil	Organizer
Cheryl	Briggs	Invited
Nicholas	Cunniffe	Remote
Zhilan	Feng	Invited
Karen	Garrett	Invited
Louis (Lou)	Gross	Invited
Frederic	Hamelin	Invited
Frank	Hilker	Invited
Carrie	Manore	Remote
Alison	Power	Invited
Megan	Rua	Invited

Models of Produce Contamination WG M2 1/11/2017

Ana	Allende	Invited
Lydia	Bourouiba	Remote
Maria	Brandl	Invited
Renata	Ivanek	Organizer
Rongsong	Liu	Invited
Daniel	Munther	Organizer
Parthasarathy (Partha)	Srinivasan	Invited
Martin	Wiedmann	Invited
Jianhong	Wu	Organizer

Vector Movement and Disease WG M4 1/30/2017

Nilsa	Bosque-Perez	Invited
Ariel	Cintron-Arias	Invited
David	Crowder	Organizer
Deborah	Finke	Invited
Yang	Kuang	Invited
Jo Ann	Lee	Invited
James	Legg	Invited
Suzanne	Lenhart	Invited
Jing	Li	Invited
Jan	Medlock	Organizer
David	Pattemore	Invited
Angela (Angie)	Peace	Invited
Rakefet	Sharon	Invited

Long Transients and Ecological Forecasting WG M1 3/1/2017

Karen	Abbott	Invited
Kim	Cuddington	Organizer
Gellner	Gabriel	Invited
Alan	Hastings	Organizer
Ying-Cheng	Lai	Invited
Andrew	Morozov	Organizer
Sergei	Petrovskii	Organizer
Katherine	Scranton	Invited
Francis	Tessa	Invited
Mary Lou	Zeeman	Invited

3D Modeling of Human Body Composition Working Group M1 3/13/2017

Dympna	Gallagher	Invited
Steven	Heymsfield	Organizer
Patrick	Kuiper	Invited
Courtney	Peterson	Invited
John	Shepherd	Invited
Diana	Thomas	Organizer
Isaac	Tian	Observer
Satish	Viswanath	Invited
Nakeya	Williams	Organizer
Michael	Yankovich	Organizer
Gary	Zientara	Remote

NIMBioS Incubator: Emerging Risks, Measured Responses 3/24/2017

Steven	Abel	Invited
Paul	Armsworth	Invited
Andrea	Berry	Invited
Thomas	Brandeis	Invited
Jean	Brennan	Invited
Eric	Carr	Invited
Seong-Hoon	Cho	Invited
Jane	Comiskey	Invited
Stephania	Cormier	Invited
Catherine	Crawley	Invited
Judy	Day	Invited
Kimberly	Eck	Open
Shigetoshi	Eda	Invited
Chandra	Eskridge	Open
Nina	Fefferman	Invited

Joshua	Fu	Invited
Vitaly	Ganusov	Invited
Sergey	Gavrilets	Invited
Xingli	Giam	Invited
Michael (Mike)	Gilchrist	Invited
Heidi	Goodrich-Blair	Open
Henri	Grissino-Mayer	Invited
Wesley	Hall	Invited
William	Hargrove	Invited
David	Harris	Invited
Jon	Hathaway	Invited
Caleb	Hickman	Invited
Lynn	Hodge	Invited
Haley	Holt	Invited
Tian	Hong	Invited
Sally	Horn	Invited
Henriette (Yetta)	Jager	Invited
Colleen	Jonsson	Invited
Susan	Kalisz	Invited
James	LeDuc	Open
Suzanne	Lenhart	Invited
Mike	Leuze	Invited
Kui	Li	Invited
Sondra	LoRe	Invited
Bill	Martin	Invited
Ryan	McManamay	Invited
Sally	Morris	Open
Yoshinori	Nakazawa	Invited
Agricola	Odoi	Invited
Brian	O'Meara	Invited
George	Ostrouchov	Invited
Sally	Palmer	Invited
Thanos	Papanicolaou	Invited
Mona	Papes	Invited
Michael	Peek	Invited
Gary	Petko	Invited
Reuben	Pine	Open
Ana	Richters	Invited
Dave	Rogers	Invited
John	Schwartz	Invited
Shih-Lung	Shaw	Invited
Kimberly	Sheldon	Invited
Charles	Sims	Invited

Amber	Smith	Invited
Betsy	Smith	Invited
Bill	Stanley	Open
Gale	Stanley	Invited
Robert	Stewart	Invited
Paul	Super	Invited
Liem	Tran	Invited
Jennifer	Webster	Open
Chris	Welsh	Invited
Michael	Whitt	Invited
Robert	Williams	Invited
Chris	Wilson	Invited
John	Zobel	Invited

Spatial Cell Simulations WG M4 3/27/2017

James	Faeder	Organizer
Margaret	Johnson	Invited
Carlos	Lopez	Remote
Martin	Meier-Schellersheim	Invited
Ion	Moraru	Invited
Robert	Murphy	Remote
Julie	Theriot	Remote
Adelinde	Uhrmacher	Remote

BoA Virtual Meeting April 2017 4/20/2017

Linda	Allen
Pamela	Bishop
Lydia	Bourouiba
Alison	Buchan
Zhilan	Feng
Sergey	Gavrilets
John	Glasser
Colleen	Jonsson
Jacob	LaRiviere
Suzanne	Lenhart
Claudia	Munoz-Zanzi
Brian	O'Meara
Peter (Pete)	Richerson
Jorge	Velasco-Hernandez
Chris	Welsh

NIMBioS Affiliate Faculty

Steven	Abel
Michael	Berry
Barry	Bruce
Virginia	Dale
Judy	Day
Shigetoshi	Eda
Nina	Fefferman
Vitaly	Ganusov
Michael (Mike)	Gilchrist
Henriette (Yetta)	Jager
Jaewook	Joo
Agricola	Odoi
Brian	O'Meara
Dan	Simberloff
Jeremy	Smith
Albrecht	von Arnim
Xiaopeng	Zhao

Graduate Research Assistant 2016

Elizabeth	Johnson
Cedric	Landerer
Katie	Massana
Robert	Pullen

Postdoctoral Fellow

Sarah	Flanagan
Nels	Johnson
Quentin	Johnson
Nourridine	Siewe
Lauren	Smith-Ramesh
Sergei	Tarasov
Oyita	Udiani

Short-term Visitors

Suzanne	Alonzo	4/10/2017	4/11/2017
Alin	Coman	3/4/2017	3/6/2017
Dina	Fonseca	3/4/2017	3/6/2017
Agnesa	Redere	3/4/2017	3/6/2017
Samantha	Schwab	3/4/2017	3/6/2017
Daniel	Franco	12/14/2016	12/21/2016

Frank	Hilker	12/14/2016	12/21/2016
Avner	Friedman	12/5/2016	12/7/2016
Brad	Greening	4/7/2017	4/7/2017
Eric	Lofgren	4/12/2017	4/13/2017
Istvan	Miko	3/31/2017	4/3/2017
Matthew	Yoder	3/31/2017	4/3/2017
Angela	Chuang	10/16/2016	10/19/2016
Laura	Miller	10/16/2016	10/19/2016
Iordanka	Panayotova	10/16/2016	10/19/2016
Kimberly	Sheldon	10/16/2016	10/19/2016
Longhua	Zhao	10/16/2016	10/19/2016
Mark	Moffett	10/11/2016	10/13/2016
Sergei	Petrovskii	11/6/2016	11/17/2016
Richard	Rebarber	3/23/2017	3/24/2017
J. Michael	Reed	11/1/2016	11/30/2016
Jay	Ver Hoef	10/17/2016	10/19/2016
Ward	Wheeler	4/17/2017	4/19/2017

NIMBioS Seminar Series 2016-2017

Sarah	Flanagan	9/20/2016
Avner	Friedman	12/6/2016
Mark	Moffett	10/11/2016
Sergei	Petrovskii	11/8/2016
J. Michael	Reed	11/15/2016
Nourridine	Siewe	9/6/2016
Lauren	Smith-Ramesh	10/4/2016
Jay	Ver Hoef	10/17/2016
Suzanne	Alonzo	4/11/2017
Brad	Greening	4/7/2017
Eric	Lofgren	4/13/2017
Richard	Rebarber	3/27/2017
Oyita	Udiani	1/31/2017
Ward	Wheeler	4/18/2017

Sustainment Events

NIMBioS GRA in Science Education Research and Evaluation

Dammika	Walpitage

NIMBioS Postdoctoral Fellow in Science Education Research and Evaluation

Robin	Taylor

NISER Evaluation Associate

Kevin	Kidder
Sondra	LoRe

NSF INCLUDES Tutorial: Modern Methods in Program Evaluation 2/22/2017

Kamal	Ali	Open
Kurt	Anderson	Open
Nicole	Becker	Open
Pamela	Bishop	Organizer
David	Bressoud	Invited
Nikolay	Brodskiy	Open
Sunshine	Brosi	Open
Ernest	Brothers	Organizer
Carol	Colaninno	Open
Devon	Collins	Open
Disan	Davis	Open
Gregory	Goins	Open
Jackson	Greene	Invited
Louis (Lou)	Gross	Organizer
Melvin	Hall	Invited
Gabriela	Hamerlinck	Open
Cynthia	Hampton	Open
Kloo	Hansen	Open
Barbara	Heath	Invited
Eurmon	Hervey	Invited
Kathryn	Hollar	Open
Geoff	Hunt	Open
Anne-Barrie	Hunter	Open
Dianne	Jennings	Open
Ashanti	Johnson	Invited
Kirk	Knestis	Invited

Gregory	Kranich	Open
Frances	Lawrenz	Invited
Suzanne	Lenhart	Organizer
Jeremi	London	Open
Sondra	LoRe	Invited
Meghan	Marrero	Open
Daniela	Marshall	Open
Carman	Melendrez	Open
Cynthia	Phillips	Open
Christopher	Rates	Open
Nadeene	Riddick	Open
Michael	Thompson	Open
Sarah	Weisberg	Open
Cassie	Xu	Open

NSF INCLUDES Conference on Multi-Scale Evaluation in STEM Education 2/23/2017

Linda	Akli	Open
Kamal	Ali	Open
Kurt	Anderson	Open
Bernice	Anderson	Open
Mehmet	Aydeniz	Open
John	Baker	Open
Sanjay	Bapna	Open
Wendy	Barnard	Open
Kristin	Bass	Open
Nicole	Becker	Open
Pamela	Bishop	Organizer
Nena	Bloom	Open
Elizabeth	Blume	Open
Julie	Bokor	Open
Whitney	Bortz	Open
David	Bressoud	Invited
Jennifer	Broatch	Open
Nikolay	Brodskiy	Open
Sunshine	Brosi	Open
Ernest	Brothers	Organizer
Wilella	Burgess	Open
Imelda	Castaneda-Emenaker	Open
Carol	Colaninno	Open
Devon	Collins	Open
Mark	Connolly	Open
Guadalupe	Corral	Open

Lisa	Corwin	Open
Alycia	Crall	Open
Disan	Davis	Open
Elizabeth	Edmondson	Open
Ben	England	Open
Susan	Eriksson	Open
Julee	Farley	Open
Jill	Feldman	Open
Kasey	Fristoe	Open
Tonya	Gerald-Goins	Open
Gregory	Goins	Open
Timothy	Goodale	Open
Jackson	Greene	Invited
Louis (Lou)	Gross	Organizer
Melvin	Hall	Invited
Gabriela	Hamerlinck	Open
Cynthia	Hampton	Open
Kloo	Hansen	Open
Sekeenia	Haynes	Open
Barbara	Heath	Invited
Eurmon	Hervey	Invited
Kathryn	Hollar	Open
Geoff	Hunt	Open
Anne-Barrie	Hunter	Open
Ellen	Iverson	Open
Kristin	Jenkins	Open
Dianne	Jennings	Open
Ashanti	Johnson	Invited
Lisa	Kaczmarczyk	Open
Kevin	Kidder	Open
Karen	Kinsman	Open
Bridgette	Kirkpatrick	Open
Kirk	Knestis	Invited
ravinder	koul	Open
Gregory	Kranich	Open
Frances	Lawrenz	Invited
Suzanne	Lenhart	Organizer
Jeremi	London	Open
Sondra	LoRe	Invited
Kathy	Malone	Open
Meghan	Marrero	Open
Daniela	Marshall	Open
Catherine	Martin-Dunlop	Open

Melissa	McCartney	Open
Carman	Melendrez	Open
Marisa	Moazen	Open
Teresa	Mourad	Open
Phyllis	Newbill	Open
Carolyn	Nichol	Open
Asamoah	Nkwanta	Open
Jenda	Overtoun	Open
Cynthia	Phillips	Open
Christopher	Rates	Open
Kelley	Remole	Open
Nadeene	Riddick	Open
David	Shannon	Open
Regina	Sievert	Open
Stephanie	Simmons	Open
Chitra	Solomonson	Open
Chih-Che	Tai	Open
Robin	Taylor	Open
Michael	Thompson	Open
Linda	Thurston	Open
John	Tillotson	Open
Ben	Van Dusen	Open
Noemi	Waight	Open
Susan	Walden	Open
Linda	Warner	Open
Andrea	Weinberg	Open
Sarah	Weisberg	Open
Mary	White	Open
Christopher	Williams	Open
Laura	Wilson	Open
Cassie	Xu	Open

Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-4. Description of Activities

Addendum-Description of Activities

DESCRIPTION OF MAJOR ACTIVITIES SEPTEMBER 1, 2016 – AUGUST 31, 2017

During September 1, 2016 through August 31, 2017 reporting period, NIMBioS hosted (or will host this summer) 18 meetings of 16 different Working Groups, three Investigative Workshops, three Tutorials, and five additional workshops. There are projected to be more than 800 participants in NIMBioS-hosted activities during this period with 8 Postdoctoral Fellows in residence, and 26 Short-term Visitors, and one visiting Graduate Student Fellow.

Demographics data on all participants are available for events from September 1, 2016 through April 30, 2017 and are presented in detail in the NIMBioS Evaluation Report (see Section Y9-2 of the attached addendum to this Annual Report) and summarized below. There were 589 participants through April 30, 2016, from 19 countries and 42 U.S. states as well as the District of Columbia representing 187 different institutions. International participants amounted to 14% of all participants. Most participants were college or university faculty (50%), but undergraduates (10%), post-doctoral researchers (6%), and graduate students (5%) accounted for a significant fraction of participants. Across all events female representation was 44%, and minority representation was near 18%. Representation of various minority categories was slightly above levels of minority representation for doctoral recipients in the biological sciences and the mathematical sciences. Short-term Visitors from September 1, 2016 through April 30, 2017 were from 21 different institutions and collaborated with NIMBioS post-doctoral fellows, faculty from four University of Tennessee departments, and 11 external researchers.

Below is a short description of each of the Working Groups, Investigative Workshops, and Tutorials held September 1, 2016 and planned through August 31, 2017 as well as a listing of short-term visitors and their projects and Outreach and Education activities. A listing of participants in each activity is provided in Section Y9-3 of this addendum.

WORKING GROUPS

Working Group: Modeling Organisms-to-Ecosystems
http://www.nimbios.org/workinggroups/WG_o2e
Organizers: Valery E. Forbes (Biological Sciences, University of Nebraska-Lincoln) and Christopher Salice (Director of Environmental Science and Studies, The Jess and Mildred Fisher College of Science and Mathematics, Towson University, Towson, MD)
This multidisciplinary Working Group brings together population-, community-, and ecosystem ecologists, ecotoxicologists, and mathematicians with interest and expertise in developing dynamic, mechanistic models of complex systems to predict impacts on ecosystem function and service delivery from data typically collected to support chemical risk assessments. In particular, the models that we develop will be designed to bridge the gap between the properties of populations and the delivery of ecosystem services. This Group works closely with the NIMBioS Working Group on Modeling Molecules-to-Organisms.
Meeting dates: Sept. 26-29, 2016

Working Group: Teaching Quantitative Bio
http://www.nimbios.org/workinggroups/WG_quantbio
Organizers: Carrie Diaz Eaton (Mathematics, Unity College), Sam Donovan (Biology, Univ. of Pittsburgh), M. Drew LaMar (Biology, College of William and Mary), and Kristin Jenkins (Director, BioQUEST)

This working group brings together representatives of diverse quantitative and biological education communities to develop an instructional model that supports the integration of quantitative and biological problem solving practices. The goal of this instructional model is to provide an accessible framework for integrating broad types of biological reasoning with diverse quantitative disciplinary skills. By bridging mathematical, computational, statistical and other quantitative approaches with biological problem solving, this instructional model will act as a resource for developing, evaluating, modifying, and implementing instructional materials across the biological and quantitative spectrum.
Meeting dates: Oct. 6-8, 2016; May 11-13, 2017

Working Group: Remotely Sensing Biodiversity
http://www.nimbios.org/workinggroups/WG_biodiversity
Jeannine Cavender-Bares (Ecology, Evolution and Behavior, Univ. of Minnesota), Phil Townsend (Forest and Wildlife Ecology, Univ. of Wisconsin), Brian O'Meara (Ecology and Evolutionary Biology, Univ. of Tennessee), and Jose Meireles (Ecology, Evolution and Behavior, Univ. of Minnesota)
Remote sensing of biodiversity is critical at a time when the Earth's biodiversity loss due to human activities is accelerating at an unprecedented rate. Functional plant diversity is highly associated with plant biodiversity, and recent technological and computational advances allow the detection of plant functional traits and trait diversity from spectral data that can be remotely sensed. Although biodiversity itself cannot practically be observed everywhere, if functional traits and trait diversity can be remotely sensed using spectral data, the potential exists to at least globally inventory the diversity of traits associated with terrestrial biodiversity. Moreover, spectral data and the functional traits they predict can be linked to phylogenetic data as a means to estimate changes in biodiversity patterns globally. However, the mathematical models and computational approaches to integrate multiple complex multidimensional datasets are underdeveloped. We bring together biological and computational experts from three disciplines—remote sensing and leaf optics, plant functional biology and systematics—to develop a framework and set of computational tools for linking spectral data, functional traits, and phylogenetics. Our goal is to transform the ability of humanity to detect and interpret the changing functional biodiversity of Planet Earth.
Meeting dates: Oct. 11-13, 2016

Working Group: Spatial Cell Simulations
http://www.nimbios.org/workinggroups/WG_cellsim
Organizers: Robert F. Murphy (Computational Biology, School of Computer Science, Carnegie Mellon Univ.) and James R. Faeder (Computational and Systems Biology, Univ. of Pittsburgh)
This Working Group addresses the critical issues in creating realistic mathematical/computational simulations of the inner workings and dynamics of eukaryotic cells, especially by accurately simulating changes in shape and organization over time. The issues to be addressed include methods for simulation that can consider dynamic cell and organelle shapes and positions (movable boundary conditions) and methods for learning joint probability distributions for thousands of cellular components. The Group’s goal is to develop new approaches and implement them in software. Activities also include development of proposals for funding and development of training materials for biomedical researchers.
Meeting dates: Oct. 19-21, 2016; March 27-29, 2017

Working Group: Caulobacter Cell-Cycle Model
http://www.nimbios.org/workinggroups/WG_cellcycle
Organizers: Yang Cao (Computer Science, Virginia Tech); Srividya Iyer-Biswas (Physics, Purdue Univ.) and John Tyson (Biological Sciences, Virginia Tech)

Microbial systems provide a unique setting for probing biological dynamics at multiple scales (sub-cellular, cellular and population levels). The free-living aquatic bacterium *Caulobacter crescentus* is a model organism for studying the cell cycle. This Working Group combines the wealth of available data at the molecular, single-cell and population levels to build a multiscale, highly constrained, predictive model of the cell cycle of C. crescentus. This integrative model also aims to capture the inherent stochasticity of the underlying processes, and thus the resultant stochasticity in cell-division times for this model organism. This Working Group brings together active researchers working on various aspects of *C. crescentus* cell-cycle dynamics, including experimentalists, modelers and theorists, to discuss recent progress in this field, accelerate collaboration among them, and to produce an integrative model in the end.
Meeting dates: Oct. 20-21, 2016

Working Group: Leptospirosis Modeling
http://www.nimbios.org/workinggroups/WG_leptospira
Organizers: Claudia Munoz-Zanzi (Division of Epidemiology and Community Health, School of Public Health, Univ. of Minnesota) and Jorge Velasco-Hernandez (Inst. of Mathematics, Universidad Nacional Autonoma de Mexico)
This working group uses mathematical approaches for improving our knowledge in the general areas of i) transmission dynamics at a local scale involving multi-host systems as well as one or more circulating Leptospira strains and ii) mechanisms underlying temporal and spatial patterns of leptospirosis transmission. A diverse and multidisciplinary team of experts is developing new approaches to gain insight into the processes influencing the ecology and epidemiology of leptospirosis in complex natural systems. Mathematical models are used to provide scientifically-based recommendations on optimal interventions and surveillance programs, which can assist with effective implementation of public and animal health programs. Broader impacts include innovations in mathematical methods and in methods to investigate zoonotic infections in general.
Meeting dates: Nov. 1-4, 2016

Working Group: Ecological Network Dynamics
http://www.nimbios.org/workinggroups/WG_econetworks
Organizers: David Hembry (Molecular and Cell Biology, Univ. of California, Berkeley), Dominique Gravel (Biology, Univ. of Quebec, Rimouski, Canada), Paulo Guimaraes Jr. (Ecology, Univ. of Sao Paulo (USP), Brazil) and James O'Donnell (School of Marine and Environmental Affairs, Univ. of Washington, Seattle)
The rapidly advancing field of spatial ecology has demonstrated that processes operating over spatial and temporal scales have strong effects on ecosystems and their constituent organisms. However, research in either field seldom incorporates information from the other. In part, this endeavor has been hindered by the limited availability of datasets spanning suitably large spatial or temporal scales. More problematic is the lack of a theoretical framework and the analytical tools needed to interpret the spatio-temporal dynamics of ecological networks. This working group brings together a diverse group of scientists whose expertise spans both fields, including field biologists along with theoreticians and computational biologists.This group will develop working hypotheses for factors driving network dynamics based on empirical patterns; explore one or more case studies of variation across space or time in ecological networks; and develop a new model of network dynamics based on the theory of island biogeography, incorporating biogeography, coevolution, and community ecology, to be used in interpreting empirical patterns.
Meetings dates: Nov. 14-17, 2016

Working Group: Modeling Molecules-to-Organisms

http://www.nimbios.org/workinggroups/WG_m2o
Organizers: Cheryl A. Murphy (Fisheries and Wildlife, Lyman Briggs College, Michigan State Univ.) and Roger Nisbet (Ecology, Evolution, and Marine Biology, Univ. of California at Santa Barbara)
This Working Group brings together a multi-disciplinary group of molecular biologists, systems biologists, DEB (dynamic energy budget) and AOP (adverse outcome pathway) modelers, ecotoxicologists and mathematicians with interest and expertise in developing dynamic, mechanistic models to predict impacts on individuals from high throughput assays used to screen chemicals for potential risk. Using a case study approach to demonstrate proof of concept, the Group will aim to develop not only example models but a general framework for model development, evaluation, and communication that can be applied across different levels of biological organization and ecotoxicological endpoints relevant to the individual. This Group closely coordinates with the NIMBioS Working Group on Modeling Organisms-to-Ecosystems using the same case study species (i.e. daphnids and trout) with the intent to develop a modeling framework that ultimately can link from molecular responses (AOPs) through whole organism responses to ecosystem service delivery.
Meeting dates: Nov. 29-Dec. 2, 2016

Working Group: Prediction and Control of Cardiac Alternans
http://www.nimbios.org/workinggroups/WG_arrhythmias
Alena Talkachova (Biomedical Engineering, Univ. of Minnesota) and Xiaopeng Zhao (Mechanical, Aerospace, and Biomedical Engineering, Univ. of Tennessee, Knoxville)
Cardiac alternans manifests at the cellular level as a beat-to-beat alternation in action potential duration (APD) and at the whole heart level as an alternating change in the amplitude or shape of the T-wave in the electrocardiogram (ECG). Specifically, we use a system-based approach to develop and test new algorithms for APD alternans prediction, both at cellular and tissue levels; translate the criteria for predicting APD alternans into whole-heart ECG recording; and develop novel control schemes to suppress alternans using bifurcation control and optimization techniques.
Meeting dates: Dec. 14-16, 2016

Working Group: Multiscale Vectored Plant Viruses
http://www.nimbios.org/workinggroups/WG_plantviruses
Organizers: Vrushali A. Bokil (Mathematics, Oregon State Univ., Corvallis), Linda J. S. Allen (Mathematics and Statistics, Texas Tech Univ., Lubbock), and Alison Power (Ecology & Evolutionary Biology, Cornell Univ.)
This group is working on current problems related to multiscale aspects of the spatial and temporal transmission and the evolution of vectored plant viruses. The group's goals are to derive novel mathematical, statistical, and computational methods that incorporate multiple hosts and multiple pathogens operating at varying spatial and temporal scales to bring insight into the effects of climate change and human activities on the emergence of new plant viruses.
Meeting dates: Dec. 19-23, 2016

Working Group: Models of Produce Contamination
http://www.nimbios.org/workinggroups/WG_produce
Organizers: Lydia Bourouiba (Civil and Environmental Engineering, MIT), Renata Ivanek (Population Medicine and Diagnostic Sciences, Cornell Univ.), Daniel Munther (Mathematics, Cleveland State Univ.), and Jianhong Wu (Mathematics, York Univ.)
Foodborne illnesses associated with fresh produce continue to impose heavy public health and socio-economic burdens. To advance produce food safety, it is critical to adopt a mechanistic approach that uses mathematical modeling for holistic understanding of processes shaping

pathogen introduction and transfer at the preharvest level. Toward that goal, we have assembled researchers from food science, microbiology, epidemiology, mathematics and bio-statistics, and government agencies to develop detailed pathogen/produce specific mathematical models. The developed models will elucidate how underlying small-scale processes, such as raindrops or irrigation types, contribute to the patterns of spread of contaminants in a field. These results are expected to inform future experimental work and redesign of the existing macroscale (e.g., risk assessments) models, both of which will uniquely support submission of research grant proposals. Ultimately, these efforts will lead to development of improved tools to prioritize prevention and surveillance efforts in produce food safety.
Meeting dates: Jan. 11-13, 2016

Working Group: Vector Movement and Disease
http://www.nimbios.org/workinggroups/WG_vector
Organizers: Allison Shaw (Ecology, Evolution and Behavior, Univ. of Minnesota), David Crowder (Entomology, Washington State Univ.) and Jan Medlock (Biomedical Sciences, Oregon State Univ.)
We currently lack a comprehensive understanding, both empirically and theoretically, of the role that vector movement plays in the spread of plant pathogens. The goals of this working group are to (i) develop a general understanding of how vector movement is driven by vector population dynamics, characteristics of host plants and landscapes, and community dynamics, and (ii) investigate the implications of vector movement for the dispersal of vector-borne plant pathogens. The working group brings together expertise from the fields of mathematics, ecology, entomology, plant sciences, epidemiology, and animal movement. The approach combines existing modeling techniques from the broader animal movement literature with mathematical models for vector-borne pathogen transmission.
Meeting dates: Jan. 30 – Feb. 2, 2017

Working Group: Long Transients and Ecological Forecasting
http://www.nimbios.org/workinggroups/WG_ltt
Organizers: Alan Hastings (Environmental Science and Policy, Univ. of California, Davis); Kim Cuddington (Biology, Univ. of Waterloo, Canada); Andrew Morozov (Mathematics, Univ. of Leicester, UK); and Sergei Petrovskii (Mathematics, Univ. of Leicester, UK)
A new challenge for theoretical and empirical ecology is to understand the implications of long-living transients (LLT). The presence of LLT can be an explanation of regimes shifts alternative to "tipping points," so understanding of LLT would substantially improve the quality of long-term forecasting and crisis anticipation. This Working Group seeks to make substantial progress in better understanding the role of LLT in ecology and in developing appropriate research techniques for long-term ecosystem management. The overall goal is to construct a unifying theory of LLT by combining the existing empirical facts, mathematical models, computational approaches and appropriate methods of data analysis.
Meeting dates: March 1-3, 2017

Working Group: 3D Modeling of Human Body Composition
http://www.nimbios.org/workinggroups/WG_3d
Organizers: Steven B. Heymsfield (Pennington Biomedical Research Center, Baton Rouge, LA); Diana Thomas, Center for Quantitative Obesity Research, Montclair State Univ., NJ; USMA Nakeya Williams, Mathematical Sciences, US Military Academy, West Point, NY
Michael Yankovich, Mathematical Sciences, US Military Academy, West Point, NY
Laser image technology has provided a novel method to automatically develop a 3D rendering of the human body, eliminating the reliance on burdensome and often inaccurate clinical

measurements such as body mass index (BMI) and waist circumference. The purpose of this working group is to bring together a uniquely diverse team of investigators from body composition, mathematical modeling, and the military to 1) derive accurate predictions of muscle, bone, and fat mass from the reconstructed image; 2) develop cardiovascular risks and thermoregulation scores that align to every available geometrical measurement of body shape acquired from the image; and 3) design and clinically deploy a user-friendly software tool to automatically deliver predictions.
Meeting dates: March 13-14, 2017

Working Group: Optimal Control of NTDs
Organizers: Giulio De Leo, Biology (Hopkins Marine Station, Stanford Univ.); Calistus Ngonghala (Mathematics and Emerging Pathogens Inst., Univ. of Florida, Gainesville); and Justin Remais (School of Public Health, Univ. of California, Berkeley)
Neglected Tropical Diseases (NTDs) such as amebiasis, Chagas disease, hookworm, leishmaniasis, and schistosomiasis affect more than 1.4 billion people worldwide. Their impacts—expressed as mortality, morbidity, reduced educational and employment opportunities, or social stigma—tend to be greatest among the global rural poor. Controlling NTDs is particularly challenging because of a lack of vaccines that can provide life-long immunity, and the existence of important environmental reservoirs where pathogens persist even as populations are successfully treated for their infections. After mass drug administrations (MDA) of the population at risk, treated people are commonly re-exposed to the parasite or pathogen in the environment, resulting in an endless cycle of treatment and reinfection. Two and a half billion dollars are currently disbursed yearly in tropical and subtropical regions in efforts to control NTDs. Such funding and control efforts are directed mainly toward MDA, with little theoretical understanding of the dynamics of elimination, nor of the conditions for optimal, cost-effective intervention. This Working Group investigates cost-effective NTD control and elimination measures through the application of optimal control theory and through the use of cutting-edge computational techniques applied to a range of mathematical transmission models exhibiting increasing levels of complexity. The group will assess the cost-effectiveness of alternative strategies for NTD elimination in addition to MDA, as well as innovative and creative ecological solutions aimed at interrupting environmental transmission through water, sanitation and hygiene interventions and biological control of free-living stages of pathogens and/or intermediate hosts.
Meeting dates: May 8-10, 2017

Working Group: Ecosystem Federalism
http://www.nimbios.org/workinggroups/WG_ecofed
Organizers: Julie Blackwood (Mathematics and Statistics, Williams College, Williamstown, MA) and Charles Sims (Economics, Univ. of Tennessee; Howard H. Baker Jr. Center for Public Policy, Knoxville)
The characterization of problems and solutions in managed ecosystems is often guided by the current allocation of regulatory authority between different levels of government. For instance, in the United States, it is common for federal agencies to set minimum standards for ecosystem protection while states and local governments are charged with identifying the policy or set of policies that will best meet those standards. This group will explore mathematical, control/optimization, game theoretic, and econometric frameworks and tools that can be used to determine how regulatory authority over ecological outcomes should be allocated between a central (federal) government and local (state, municipal) governments. Our goal is to develop novel mathematical, statistical, and computational methods that incorporate optimal strategic, adaptive management of ecosystem services at multiple interacting levels of government. The

group is co-sponsored and partially supported by the Howard Baker Center for Public Policy at the University of Tennessee.
Meeting dates: June 28-30, 2017

INVESTIGATIVE WORKSHOPS

Investigative Workshop: Next Generation Genetic Monitoring
http://www.nimbios.org/workshops/WS_nextgen
Organizers: Sean Hoban (Tree Conservation Biologist, Morton Arboretum, Lisle, IL); Michael W. Bruford (Biosciences, Cardiff Univ., Wales, UK); Louis Bernatchez (Biology, Univ. Laval, Canada); and Erin Landguth (Computational Ecology Laboratory, Univ. of Montana)
As biodiversity loss accelerates and environmental challenges mount, there is need for quantitative evaluation of the status and trends of genetic biodiversity. However, appropriate mathematical tools for this evaluation are lacking. There is an urgent need to conceive and develop standard, summary-level genetic indices that are robust, easily interpretable and tractable across diverse datasets. In this workshop we developed a framework for constructing these mathematical tools. Specifically, this workshop identified key attributes of successful indices in biodiversity science, surveyed and critiqued existing genetic metrics, and identified potential statistical approaches suitable for summarizing the highly dimensional nature of genetic data. More broadly, the workshop laid a foundation for developing new theory and approaches for describing, quantifying, and interpreting the complex, multidimensional information contained in biodiversity datasets.
Meeting dates: Nov. 7-9, 2016

Investigative Workshop: Species' Range Shifts in a Warming World
http://www.nimbios.org/workshops/WS_rangeshifts
Organizers: Sean Hoban (The Morton Arboretum, Lisle, IL); Allan Strand (Biology, College of Charleston, SC); Andria Dawson (Statistics, Univ. of California, Berkeley; Geosciences, Univ. of Arizona, Tucson) and Michelle Lawing (Ecosystem Science and Management, Texas A&M Univ., College Station)
Climate change is dramatically altering species' ranges and community composition, which will impact forest productivity, carbon cycling, and global biodiversity. Understanding how species and communities responded to past climatic changes, especially to dramatic warming following Ice Ages, can help us predict and mitigate future outcomes. However, our current understanding of historic ranges and species' dynamics, based on single data types and outdated methods, is deficient (and sometimes misleading). Moreover, we lack a framework for explicit hypothesis testing of post-Ice Age biogeographical inference. This workshop aims to improve our ability to understand species' and community response to climate change by identifying new modeling and analytical tools for integrating currently isolated datasets and fields of research on large-scale ecosystem shifts.
Meeting dates: May 3-5, 2017

Investigative Workshop: Pan-microbial Trait Ecology
Organizers: Elena Litchman (Michigan State Univ.); Christine Hawkes (Univ. of Texas, Austin); and Chris Klausmeier (Michigan State Univ.)
This workshop aims to lay the groundwork for a mechanistic trait-based framework for different microbial taxa by combining several fundamental fields, from genomics and metabolic modeling to community ecology and ecosystem modeling. We will identify key traits that can be used in community and ecosystem models and outline ways to derive such traits from known microbial genomes and metabolic networks. We will explore several biological and computational challenges within this topic, such as linking cellular metabolism to phenotypic traits, developing

multidimensional models, reducing model complexity, modeling trait evolution at different levels and expanding metabolic models to the level of microbial communities.
Meeting dates: June 14-16, 2017

SUSTAINMENT ACTIVITIES

NSF INCLUDES Conference: Multi-scale Evaluation in STEM Education
Organizers: Louis J. Gross (Ecology and Evolutionary Biology and Mathematics; Director Emeritus, NIMBioS; Director, The Institute for Environmental Modeling, Univ. of Tennessee, Knoxville); Pamela Bishop (Director, National Institute for STEM Evaluation; NIMBioS Associate Director for STEM Evaluation); Ernest Brothers (NIMBioS Associate Director for Diversity Enhancement; Assoc. Dean of the Graduate School and Director of the Office of Graduate Training and Mentorship, Univ. of Tennessee, Knoxville); and Suzanne Lenhart (NIMBioS Associate Director for Education and Outreach; Mathematics, Univ. of Tennessee, Knoxville)
NIMBioS and NISER co-hosted an NSF INCLUDES Conference on Multi-Scale Evaluation in STEM Education. Effective program evaluation is an essential component of STEM education and workforce development. The conference and associated events aimed to enhance participants' abilities to develop an evaluation plan that meets the needs of an INCLUDES Alliance Project. Participants included individuals involved in current INCLUDES projects, those considering collaborating in such projects and STEM educators considering inclusion of formal evaluation in their projects.
Meeting dates: Feb. 23-24, 2017

NIMBioS Synthesis Incubator: Emerging Risks, Measured Responses
http://www.nimbios.org/incubator/
Roundtable discussions and an evening networking event addressed a diverse set of problems representing Emerging Risks to forge new collaborative networks and new paths to Measured Responses. Roundtable 1: Active Learning for the "M" in STEM: Preparing Students for Emerging Risks; Roundtable 2: Building Adaptive Capacity into Conservation and Natural Resource Management Plans; Roundtable 3: Big Data in Spatial Biology and Emerging Interdisciplinary Actions; Roundtable 4: The Biological and Evolutionary Dimensions of Host-Pathogen Interactions
Organizers: NIMBioS
Meeting date: March 24, 2017

NIMBioS/Syngenta Workshop: Applying Optimization Techniques to Agricultural Problems
http://www.nimbios.org/ws_syngenta_optimize/
Organizers: Dieter Armbruster (Mathematics, Arizona State Univ.) and Nina Fefferman (Ecology and Evolutionary Biology, Univ. of Tennessee)
Syngenta will conduct a workshop at NIMBioS to explore the application of mathematics and decision theory to agriculture problems. Syngenta is interested in bringing advanced methods from mathematical and computer science research to bear on sequential seed gene cultivation and selection problems in agriculture, incorporating elements of statistics, optimization, data mining, machine learning, and mathematical modeling. The goal of this workshop is to bring together researchers from these fields with agricultural experts to collaborate across disciplinary boundaries to investigate solutions to basic and applied agricultural problems. Participation is by invitation only.

SHORT-TERM VISITORS

[Missing From Last Year’s Report]

Calistus Ngonghala (Mathematics, Univ. of Florida) and Eric Numfor (Mathematics, Augusta Univ.) collaborated on a project with S. Lenhart to develop models for optimal control management and treatment of malaria. (July 2016)

[This Year's Reporting Period]

Mark W. Moffett (National Museum of Natural History) gave a seminar and visited with postdoctoral fellows. (Oct. 11-12, 2016)

Laura Miller (Mathematics and Biology, UNC-Chapel Hill); Angela Chuang (Ecology & Evolutionary Biology, Univ. of Tennessee); Kimberly Sheldon (Ecology & Evolutionary Biology, Univ. of Tennessee); Longhua Zhao (Mathematics, Case Western Univ.); and Iordanka Panayotova (Mathematics, Virginia Wesleyan College), who formed as a sub-group from the NIMBioS Research Collaboration Workshop for Women in Mathematical Biology in 2015, is using computational fluid dynamics to understand the physics of ballooning used in dispersal and to solve the fully-coupled fluid-structure interaction problem of flexible, charged draglines attached to negatively buoyant spiders. (Oct. 16-19, 2016)

Jay Ver Hoef (National Marine Mammal Lab, NOAA) gave a seminar and visited with postdoctoral fellows. (Oct. 17-19, 2016)

Michael Reed (Biology, Tufts Univ.) collaborated on a project with N. Fefferman to use network tools to evaluate vulnerability of the life-cycle networks of migratory birds and early warning signals of tipping points in chronically stressed populations. (Nov. 1-30, 2016)

Sergei Petrovskii (Applied Mathematics, Univ. of Leicester) collaborated with S. Gavrilets to develop and expand research in modeling social processes and animal dynamics across space and time. He also gave a seminar talk. (Nov. 6-17, 2016)

Avner Friedman (Mathematics and Physical Sciences, Ohio State Univ.) gave a seminar. (Dec. 6, 2016)

Daniel Franco (Applied Mathematics, The National University of Distance Education, Spain) and Frank Hilker (Germany/Institute of Applied Systems, Osnabruck Univ.) collaborated with S. Lenhart and D. Burton, a UT graduate student in mathematics, on a project to apply optimal control theory to population models. (Dec. 14-21, 2016)

Dina Fonseca (Entomology, Rutgers), Alin Coman (Psychology, Princeton Univ.), Agnesa Redere (Ecology & Evolution, Rutgers Univ.) and Samantha Schwab (Ecology & Evolution, Rutgers Univ.) collaborated with N. Fefferman on a project to model Zika control effectiveness with feedback in risk perception and associated demand across scales of intervention. (Mar. 4-6, 2017).

Richard Rebarber (Mathematics, Univ. of Nebraska) gave a seminar. (Mar. 23-23, 2017)

Istvan Miko (Entomology, Pennsylvania State Univ.) and Matthew Yoder (Entomology, Univ. of Illinois) collaborated on a project with S. Tarasov to develop new ontology-informed methods for modeling the evolution of discrete morphological characters as well as a new trait enrichment approach for summarizing the dynamics of morphological evolution in phenotype. (Mar. 31 – Apr. 3, 2017)

Suzanne Alonzo (Inst. of Marine Sciences, Ecology & Evolutionary Biology, Univ. of California, Santa Cruz) gave a seminar and visited with postdoctoral fellows. (Apr. 10-12, 2017)

Brad Greening (National Center for Emerging Zoonotic and Infectious Disease) gave a seminar. (Apr. 7, 2017)

Eric Lofgren (Paul G. Allen School for Global Animal Health, Washington State Univ.) gave a seminar. (Apr. 12-13, 2017)

Ward Wheeler (Invertebrate Zoology, American Museum of Natural History, NY) gave a seminar and visited with postdoctoral fellows. (April 17-18, 2017)

Nick Panchy (Molecular Plant Sciences, Michigan State Univ.) is visited the lab of T. Hong to discuss computational systems biology projects. (projected May 22-23)

Tiago Yuzo Miyaoki (Applied Mathematics, University of Campinas, Brazil) was a Visiting Graduate Fellow collaborating on a project with N. Siewe and S. Lenhart on applying control techniques to Zika models. (May – August 2017)

Fan Bai (Texas Tech Univ.) will collaborate on the Summer Undergraduate Research project, "Modeling the Immune System Battleground in Host-Virus Conflict" with C. Jonsson (projected June 3- July 3, 2017)

Anna Fiedler (Computational Biology, Institute of Computational Biology, German Research Center for Environmental Health) will collaborate on a project with V. Ganusov to model of the interplay between tuberculosis bacteria and immune response (projected August 2017).

Education & Outreach Activities:

Outreach and Education are a significant component of NIMBioS activities. These activities cover a broad audience from elementary school (Biology in a Box (K-12)), middle school (Girls in Science, Adventures in STEM Camp), high school (math/biology curriculum programs, teacher workshops), and undergraduates (undergraduate math/biology research conference, visits to MSI partners, SRE program) to graduate students and general science population (summer graduate school with MBI, seminars, presentations). Various institutional partner visits were also made for partnering with minority-serving institutions.

The section below describes NIMBioS outreach and education activities completed or planned between September 1, 2016 and August 31, 2017.

<u>New Education and Outreach Coordinator Hired</u>

In March 2017, Kelly Sturner left NIMBioS for a position at Argonne National Lab. In May 2017, Greg Wiggins was hired as the new coordinator.

<u>2016 Summer Research Experience (SRE) for Undergraduates Program</u>

Sixteen undergraduates will participate in the 2017 NIMBioS Summer Research Experience (SRE) for undergraduates. One high school teacher also is participating. During the eight-week program, participants live on campus at the University of Tennessee, Knoxville (UT), and work in teams with NIMBioS postdocs and UT faculty to conduct research at the interface of

mathematics and biology. The award includes a stipend, housing and some funding to support travel. The projects this year are: Mating Patterns in Birds' Evolution, Temporal Dynamics in Multi-Host Systems - How Important is Seasonality?, Modeling the Spread of La Crosse Virus in East Tennessee, Modeling the Immune System Battleground in Host-Virus Conflict, and Developing Computer Games for Teaching Biology. (June-July, 2017)

Minority-Serving Institution Partner Visits

Visits were arranged for NIMBioS researchers and leadership to visit our minority-serving institution partners: Howard University (C. Edholm, March 2016) and University of Texas-El Paso (L. Gross, September 2016; S. Flanagan, April 2017). Lenhart participated in discussion and evaluation of curriculum and course issues related to Fisk University's NSF-funded HBCU-UP-TIP project. (October 2016)

Joint Math Meetings

Co-sponsored with NSF Mathematics Institutes, the Joint Mathematics Meetings are held for the purpose of advancing mathematical achievement, encouraging research, and providing the communication necessary to progress in the field. Annually, NIMBioS and the Mathematics Institutes sponsor a reception with presentations on opportunities available through these NSF-funded Institutes.

At the January 2017 meeting in Atlanta, Lenhart attended the Directors' meeting of the Mathematical Sciences Institutes. Lenhart also displayed NIMBioS opportunities at the Mathematics Institutes Reception and presented two talks: one about modeling Johne's disease related to a NIMBioS working group and one on modeling hantavirus in rodents from SRE project. Louis Gross presented a talk about the NIMBioS calculus concept inventory (with biology applications) project.

Blackwell-Tapia Conference and Awards Ceremony

The NSF Mathematical Sciences Institutes Diversity Committee hosted the 2016 Blackwell-Tapia Conference and Awards Ceremony. The lead institute was NIMBioS and the co-organizing institute was the Statistical and Applied Mathematical Sciences Institute (SAMSI). This is the ninth conference since 2000, held every other year, with the location rotating among NSF Mathematics Institutes. The conference included scientific talks, poster presentations, panel discussions, ample opportunities for discussion and interaction, and the awarding of the Blackwell-Tapia Prize. Participants (120) came from all career stages and will represent institutions of all sizes across the country, including Puerto Rico. The conference and prize honors David Blackwell and Richard Tapia, two seminal figures who inspired a generation of African-American, Native American and Latino/Latina students to pursue careers in mathematics. The Blackwell-Tapia Prize recognizes a mathematician who has contributed significantly to research in his or her area of expertise and who has served as a role model for mathematical scientists and students from underrepresented minority groups or has contributed in other significant ways to addressing the problem of underrepresentation of minorities in math. The 2016 recipient of the Blackwell-Tapia Prize is Mariel Vazquez, Professor of Mathematics and Microbiology and Molecular Genetics at the University of California, Davis. Note: Most of the funding came from an NSF grant to the NSF Mathematical Sciences Institutes Diversity

Committee and a grant to NIMBioS from the Alfred P. Sloane Foundation. (October 28-29, 2016)

Great Smoky Mountains National Park (GSMNP) Outreach
NIMBioS with Lenhart and Wiggins will lead a quantitative biology session for the Girls in Science Camp at Tremont. (June 2017)

Sturner and Lenhart represented NIMBioS at a Homecoming Networking Event at Tremont. (October 2016)

Undergraduate Research Conference at the Interface Between Biology and Mathematics
Undergraduate students engaged in research in biology and mathematics, their faculty mentors, Minority Serving Institution partners and high school teachers were invited to this seventh annual conference. The conference included student talks and posters, two guest plenary speakers, a career panel to take questions about research and careers in math biology, and a graduate school showcase. Over 100 undergraduates and faculty from academic institutions across North America were in attendance. There were over 50 undergraduate research talks and posters. (October 2016)

NIMBioS Interdisciplinary Seminars
The NIMBioS Interdisciplinary Seminar Series was held on Tuesdays during the fall and spring semesters. On Tuesdays when a formal seminar is scheduled, NIMBioS hosts an Afternoon Tea for NIMBioS staff, visitors, faculty, and post-docs as well as faculty and students from across the UT community. The teas provide an opportunity for informal collaboration, discussion and networking. (Fall 2016 and Spring 2017)

Biology in a Box
This has been a busy year for the Biology in a Box Project. In addition to completing the refurbishing of existing units in our partnering 108 school systems, one of two planned manuscripts has been submitted to the National Science Teachers Association journal series and is currently under review (Susan Riechert and Kelly Sturner: Does an Extended Black Box Problem Offer Student NOS & Statistical Probability Learning Gains?).

The Spring Job and Career Fair involved VolsTeach students engaging visitors in 5 of our 11 units, including such exercises as diet determination using skull and teeth characters from Unit 2: Of Skulls & Teeth, the caching strategy fitness game of Unit 10: Behavior, measurement from Unit 4: Simple Measures, shell spiral geometry from Unit 6: Animal Kingdom, and Fossils true /false from Unit 1: Fossils. We are adding a new STEM thematic computer game to our website that can be downloaded and used by individuals and classes. This adds to our existing Fossil Finder Game made available in 2016.

In addition to production of the new STEM Unit Biomechanics, Biology in a Box has a new initiative designed to attract teachers to our available resources and project. Toward this end, two categories of YouTube videos are being produced.

There is an Introduction series that highlights the materials available in each unit: What is Biology in a Box? We have covered each of the units in this series referred to as Unpacking the Box.

Unpacking series:
Unit 1: Fossils

Unit 2 Of Skulls and Teeth

Unit 3: Fur, Feathers and Scales- Insulation

Unit 4: Simple Measures

Unit 5: It's In Your Genes

Unit 6. Animal Kingdom

Unit 7: Backyard Naturalist

Unit 8: Everything Varies

Unit 9: Forestry

Unit 10 Behavior

Unit 11: Biomechanics

We also have initiated an Exercise Demonstration series, starting first with examples from Unit 10: Behavior. The list of YouTube videos produced to date is offered below. We plan to produce 6-8 videos of exercises representing each unit to advertise the project and availability of materials on YouTube. Another goal of the videos is to gain a Facebook following with teachers and others interested in STEM education. We also have posted a Spring Newsletter that we expect to publish each season highlighting Biology in a Box offerings and activities. We hope to collect data on teacher impressions of the project as well as on box usage patterns in the project. To this end, we have extended our existing IRB to include questionnaire data collected from teachers.

YouTube exercise demonstrations posted to date:
Unit 10: Exercise 1.1 Tactile Box

Unit 10: Exercise 1.2 What is the object in my box?

Unit 10: Exercise 1.3 Black Box- How science Works

Unit 10: Exercise 3.1 Find that Flower II

Unit 10: Exercise 3.2A Slap Snack Alarm

Unit 10: Exercise 3.2B Slap Snack Mimic

We are in the process of setting up a *Biology in a Box* store through UTK that will permit teachers and others to purchase individual exercises and the materials associated with them.

This will provide the project a continuing source of materials monies that are used to support the project's outreach mission.

Three of the metal buttons we are producing advertising our units.

NIMBioS SRE Collaboration with Biology in a Box
Kathy DeWein and Gale Stanley represented NIMBioS and Biology in a Box at the LEAD conference for state educators in Nashville. (November 2016)

Currently, 2D quiz screen window games are under development for the *Virtual Biology in a Box* Project. S. Riechert and M. Schuchard will co-mentor 3 SRE undergraduates (Summer 2017)

Advancing Chicanos/Hispanics & Native Americans in Science Annual Conference
NIMBioS contributed to the annual Modern Math Workshop immediately preceding the Annual Meeting of the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) in Los Angeles. The goal of this project was twofold: to reinvigorate the research careers of minority faculty and post docs and mathematics faculty at minority-serving institutions by recruiting them to participate in research programs and workshops of US-based Mathematics Institutes and to increase awareness of math-based career paths among minority undergraduates. The workshop took place October 11-13, 2016 directly preceding the Annual Meeting of SACNAS in Long Beach, CA. This allowed people who were already coming to the SACNAS meeting to attend the Modern Math workshop and also allowed people who came for the Modern Math workshop to stay for the SACNAS meeting. Programs of all NSF-funded mathematics institutes were represented at this workshop, and a representative of each institute was present: AIM, ICERM, IMA, IPAM, MBI, MSRI, NIMBioS, PCMI, and SAMSI. NIMBioS sent postdoc N. Siewe to speak about NIMBioS and his research, and Lenhart presented about opportunities at NIMBioS. (October 2016)

Teaching Workshops
Sturner, representing NIMBioS, served on the organizing committee for the Teaching Evolution workshop for area K-12 teachers as a part of the week of Darwin Day events on the UTK campus. Sturner helped facilitate the workshop. 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 about evolution. Also Lenhart and Sturner represented NIMBioS at the Darwin Day March. (February 13 and 25, 2017)

Sturner presented on Biology in a Box activities linking math and science at the Tennessee Science Teacher's Association Annual Conference in Murfreesboro, TN. (November 2016)

Lenhart and Wiggins will present activities showing mathematical modeling for a teacher professional development workshop (Math Counts III) in rural Campbell County, TN. Approximately 25 middle school teachers were expected. (June 2017)

Southern Appalachian Science & Engineering Fair
Lenhart served as judge for two awards: The Association for Women in Science and the Mu Alpha Theta prizes. (Date: April 2016)

Adventures in STEM Camp
NIMBioS will collaborate with CURENT to offer a week-long summer day camp for rising 7th and 8th grade girls on STEM (Science, Technology, Engineering, Mathematics). Lenhart, Wiggins Virginia Parkman, and Michael Peek will give presentations. (June 2017)

NIMBioS Tutorial: Uncertainty Quantification for Biological Models
Critical to achieving validated predictive computations, both forward and inverse UQ analysis have become critical modeling components for a wide range of scientific applications. Techniques from these fields are rapidly evolving to keep pace with the increasing emphasis on models that require quantified uncertainties for large-scale applications. This tutorial will focus on the application of these methods and techniques to mathematical models in the life sciences and will provide researchers with the basic concepts, theory, and algorithms necessary to quantify input and response uncertainties and perform sensitivity analysis for simulation models. About 34 participants have accepted invitations to attend.

Organizers:
- Marisa Eisenberg, School of Public Health, Univ. of Michigan
- Ben Fitzpatrick, Mathematics, Loyola Marymount Univ.
- Mac Hyman, Mathematics, Tulane Univ.
- Ralph Smith, Mathematics, North Carolina State Univ.
- Clayton Webster, Computational and Applied Mathematics (CAM), Oak Ridge National Laboratory; Mathematics, Univ. of Tennessee

This tutorial is intended for graduate students, postdocs and researchers in mathematics, statistics, computer science and biology. A basic knowledge of probability, linear algebra, and differential equations is assumed. (June 26-28, 2017)

NIMBioS Tutorial: RevBayes: Bayesian Inference of Phylogeny
This course features RevBayes, an exciting new program for Bayesian inference of phylogeny. RevBayes is the successor to the popular program MrBayes, but represents both a complete

rewrite of the computer code and a fundamental re-conception of phylogenetic models. Specifically, RevBayes adopts a graphical-model framework that views all statistical models as comprised of components that can be assembled in myriad configurations to explore a corresponding array of questions. This graphical-model approach to phylogenetic inference provides effectively infinite flexibility. Moreover, the graphical models are specified using an R-like language, Rev, that empowers users to construct arbitrarily complex phylogenetic models from simple component parts (i.e. random variables, parameter transformations and constants of different sorts). (August 7-11, 2017)

Instructors:
- Bastien Boussau, Univ. of Lyon
- Emma Goldberg, Univ. of Minnesota
- Tracy A. Heath, Iowa State Univ.
- Sebastian Höhna, Univ. of California, Berkeley
- John Huelsenbeck, Univ. of California, Berkeley
- Brian Moore, Univ. of California, Davis

School Visits, Field Trips, Conferences and Meetings

Lenhart visits Bearden High School once a week during the school year for math club enrichment activities. Lenhart helped to organize a small high school math event at Bearden High School in November. (2016-2017).

Lenhart gave seminars presenting ideas about NIMBioS at these locations: South African Mathematical Sciences Association Conference (Pretoria, S. Africa, November 2016) and Salem College (Winston-Salem, NC, March 2016), and Applied Math Conference at University of S. Illinois (Carbondale, IL, June 2017).

Sturner served as a judge at the St. Joseph School Science Fair. (February 2017)

NIMBioS helped organize and host a field trip by 6th graders from Greenback School in Loudon County, TN, which brought 50 students and one teacher for a day learning about biodiversity, touring the university library, and engineering lab tours at CURENT, an engineering research center across campus. (May 2017)

NIMBioS helped to organize a group of UT graduate students to visit Greenback School to lead biological activities with middle school students. (November 2016)

Lenhart presented about NIMBioS at the Career Fair at Talbott Elementary School, Talbot, TN. (May 2017)

Lenhart and Wiggins will lead an activity about biodiversity at the Girls in Science Camp at Tremont in the Great Smoky Mountains National Park. (June 2017)

Lenhart and Wiggins will present an activity at the STEM PUNK event for middle school students. (June 2017)

Lenhart presented about NIMBioS opportunities at the UT Undergraduate Mathematics Conference. (April 2017)

Lenhart presented two sessions about NIMBioS with a biodiversity activity at the BOSS, Big Orange Stem Symposium, UT Library. (April 2017)

Joint MBI-CAMBAM-NIMBioS Summer Graduate Workshop

NIMBioS is hosting this annual 5-day workshop for graduate students in math and biology, where the theme this year is "Connecting Biological Data with Mathematical Models."

This graduate program will have instructors from across North America whose research expertise is mathematical modeling in biological systems using real data. Some of the techniques to be covered include:

- Maximum likelihood and Bayesian approaches to inference
- Parameter estimation
- Model identifiability
- Uncertainty and sensitivity analysis

The program will include lectures on techniques and modeling using specific data sets, and there will be computer activities focusing on learning techniques and sessions to receive feedback on participants' own research problems. Researchers from the mathematical and biological sciences will be featured speakers.

Speakers include:

- Ben Bolker (McMaster University)
- Ariel Cintron-Arias (East Tennessee State University)
- Marisa Eisenberg (School of Public Health, University of Michigan)
- Nina Fefferman (University of Tennessee, Knoxville)
- Simeone Marino (University of Michigan Medical School)
- Joseph Tien(The Ohio State University)

The summer program will provide students with broad high-level training in mathematical biology that is unattainable at most institutions. The summer school is co-sponsored by the Mathematical Biosciences Institute (MBI, Ohio State), the Centre for Applied Mathematics in Bioscience and Medicine (CAMBAM), and NIMBioS. While some students receive funds to assist with deferring the cost of the workshop, some students are attending on their own funding. Thirty-eight students are participating. (June 19-23)

UT STEM REU Symposium

NIMBioS co-organized a poster symposium with several STEM-oriented REU programs on the campus of the University of Tennessee during the summer of 2017. NIMBioS SRE students presented. (July 2017)

South East Alliance for Persons with Disabilities in STEM

During the Spring 2017 semester, five undergraduate students participated in the NIMBioS program for STEM students with disabilities, as a part of the NSF-funded INCLUDES program, South East Alliance for Persons with Disabilities in STEM (SEAPD-STEM) (based at Auburn University). Lenhart and Wiggins are attending the inaugural SEAPD-STEM Conference to be held in Auburn, AL. (August 25-26, 2017)

Collaboration with NISER

NIMBioS and NISER co-hosted an NSF INCLUDES Conference on Multi-Scale Evaluation in STEM Education, funded by NSF INCLUDES program. The conference and associated events aimed to enhance participants' abilities to develop an evaluation plan that meets the needs of an NSF INCLUDES Alliance Project. Participants included individuals involved in current INCLUDES projects, those considering collaborating in such projects, and STEM educators considering inclusion of formal evaluation in their projects. The program consisted of a conference, an online webinar, and a tutorial. The webinar, Program Evaluation 101, was presented on Feb. 9 by P. Bishop, S. LoRe and L. Gross with technical support of E. Carr. The tutorial, Modern Methods in Program Evaluation, was hosted at NIMBioS on Feb. 22, the day before the conference. The conference was held at the UT Conference Center on Feb. 23-24. Also S. Lenhart, A. Richters, Brothers, R. Taylor, K. Sturner, and K. Kidder helped with these events.

Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-5. Additional Products

Featured Articles

Websites

Media Coverage

Addenda -- Additional Products (featured articles, websites, media coverage)

Feature Articles/Press Releases

April 24, 2017 Gavrilets elected member of the American Academy of Arts & Sciences
April 11, 2017 NIMBioS-UT partner to help students with disabilities
March 29, 2017 New roster of summer undergrads announced
March 28, 2017 New ideas incubating at NIMBioS
March 20, 2017 New test detects early stage of wasting disease in cattle
March 14, 2017 Power of shared pain triggers extreme self-sacrifice
March 9, 2017 Blackwell-Tapia Conference makes the grade
March 8, 2017 Science pub for postdoc Martin
March 6, 2017 Discover birds en Español
February 22, 2017 Congrats to professor Lenhart!
February 20, 2017 NIMBioS parades for science
February 17, 2017 Optimal control paper highly sought
February 15, 2017 Now showing: Program Evaluation 101
January 4, 2017 Male pipefish pregnancy, it's complicated
November 29, 2016. Human groups key to preserving natural resources
November 17, 2016 Gross joins national committee to take on data science
November 1, 2016 Vazquez receives nation's top math prize at Blackwell-Tapia
October 25, 2016 NIMBioS celebrates the nation's 'Active Learning Day' with 3D printing
October 14, 2016 "Life at the Interface" shared with undergraduate researchers at NIMBioS conference
October 3, 2016 New national institute explores evaluation science
October 3, 2016 NIMBioS postdocs: Where are they now?
October 1, 2016 Q&A with postdoc Lauren Smith-Ramesh
September 29, 2016 Text publication and more for former NIMBioS GRA
September 26, 2016 New fossil computer game teaches science, math fundamentals
September 1, 2016 Q&A with postdoc Sarah Flanagan
August 22, 2016 Working Group publishes review in American Naturalist
August 8, 2016 Special collection explores motivation of play
August 1, 2016 Q&A with postdoc Nourridine Siewe
July 18, 2016 SRE undergraduates present at Summer STEM Poster Symposium
July 12, 2016 STEM campers run like dinosaurs and design 3D models
July 7, 2016. Tails might have helped vertebrates evolve from sea to land
June 23, 2016 NIMBioS teaches the teachers
June 16, 2016 SRE team publishes in Frontiers in Microbiology
June 8, 2016 Working Group publishes new habitat management guide
June 8, 2016 Mathematical simulation of open-heart surgery lends clues to kidney failure
June 6, 2016 NIMBioS welcomes new postdocs
June 3, 2016 Constructing shale gas sites: Algorithm reduces environmental impact at reasonable expense
May 19, 2016 NIMBioS, UT welcome new faculty

May 1, 2016 Q&A with postdoc Robin Taylor

Websites

Title: The NIMBioS Website
URL: www.nimbios.org
Short Description of the Website: This is the main website for NIMBioS. As of April 2017, the website contained 1405 pages and 1649 pdf documents.

NIMBioS maintains a number of WordPress sites for Tutorials and Investigative Workshops. The site are designed to facilitate group communication and information sharing before, during and after the event, and are typically open to the public, although some areas can be set to private. These sites include the following titles and URLs:

Title: NIMBioS Tutorial: Uncertainty Quantification for Biological Models
URL: http://www.nimbios.org/wordpress-training/uncertainty/

Title: NIMBioS Investigative Workshop: Pan-microbial Trait Ecology
URL: http://www.nimbios.org/wordpress-training/microbes/

Title: NIMBioS Investigative Workshop: Species' Range Shifts in a Warming World
URL: http://www.nimbios.org/wordpress-training/rangeshifts/

Title: NIMBIoS Investigative Workshop: Next Generation Genetic Monitoring
URL: http://www.nimbios.org/wordpress-training/nextgen/

Title: NIMBioS Tutorial: Evolutionary Quantitative Genetics 2016
URL: http://www.nimbios.org/wordpress-training/eqg3/

Title: NIMBioS Tutorial: Evolutionary Quantitative Genetics 2015
URL: http://www.nimbios.org/wordpress-training/eqg2/

Title: NIMBioS Tutorial: Evolutionary Quantitative Genetics 2014
URL: http://www.nimbios.org/wordpress-training/eqg/

Title: NIMBioS Investigative Workshop: Algebraic Mathematical Biology
URL: http://www.nimbios.org/wordpress-training/algebraicmathbio/

Title: Mathematics of Planet Earth+ Workshop: Education for the Planet Earth of Tomorrow
URL: http://www.nimbios.org/wordpress-training/mpe/

Title: NIMBioS Investigative Workshop: Morphological Plant Models
URL: http://www.nimbios.org/wordpress-training/plantmorph/

Title: NIMBioS Investigative Workshop: Evolution and Warfare
URL: http://www.nimbios.org/wordpress-training/warfare/

Title: NIMBioS Investigative Workshop: Computational Advances in Microbiome Research
URL: http://www.nimbios.org/wordpress-training/microbiome/

Title: NIMBioS Investigative Workshop: Malaria-Leishmania Co-infection
URL: http://www.nimbios.org/wordpress-training/coinfection/

Title: NIMBioS Investigative Workshop: Many-cell System Modeling
URL: http://www.nimbios.org/wordpress-training/manycell/

Title: NIMBioS Graduate Workshop on Current Issues in Statistical Ecology
URL: http://www.nimbios.org/wordpress-training/gradconf2015/

Title: NIMBioS Investigative Workshop: Information and Entropy
URL: http://www.nimbios.org/wordpress-training/entropy/

Title: NIMBioS Investigative Workshop: Olfactory Modeling
URL: http://www.nimbios.org/wordpress-training/olfactory/

Title: NIMBioS Investigative Workshop: Neurobiology of Expertise
URL: http://www.nimbios.org/wordpress-training/expertise/

Title: NIMBioS Investigative Workshop: Lymphoid Cells in Acute Inflammation
URL: http://www.nimbios.org/wordpress-training/lymphoid/

Title: NIMBioS Investigative Workshop: Heart Rhythm Disorders
URL: http://www.nimbios.org/wordpress-training/cardiac/

Title: NIMBioS Tutorial: Algebraic and Discrete Biological Models for the Undergraduate Classroom
URL: http://nimbios.org/wordpress-training/mathbio/

Title: NIMBioS Investigative Workshop: Leptospirosis Modeling
URL: http://nimbios.org/wordpress-training/leptospirosis/

Title: NIMBioS Tutorial: Parameter Estimation for Dynamic Biological Models
URL: http://nimbios.org/wordpress-training/parameter/

Title: NIMBioS Investigative Workshop: Predictive Models for ERA
URL: http://nimbios.org/wordpress-training/era/

Title: NIMBioS Tutorial: Computing in the Cloud
URL: http://nimbios.org/wordpress-training/cloud/

Title: NIMBioS Investigative Workshop: Vectored Plant Viruses
URL: http://nimbios.org/wordpress-training/plantviruses/

Title: NIMBioS Investigative Workshop: Interface Disease Models
URL: http://nimbios.org/wordpress-training/interface/

Title: NIMBioS Investigative Workshop: Modeling Contamination of Fresh Produce
URL: http://nimbios.org/wordpress-training/produce/

Title: NIMBioS Investigative Workshop: Animal Social Networks
URL: http://nimbios.org/wordpress-training/animalsocialnet/

Title: NIMBioS Investigative Workshop: Insect Pest Resistance Evolution

URL: http://nimbios.org/wordpress-training/insectpest/

Title: NIMBioS Investigative Workshop: Analyzing Animal Vocal Communication Sequences
URL: http://www.nimbios.org/wordpress-training/animalvocalsequences/

Title: NIMBioS Investigative Workshop: Modeling Blood Cell Interactions
URL: http://www.nimbios.org/wordpress-training/bloodcell/

Title: NIMBioS Tutorial: Mathematical Modeling for the Cell Biology Researcher and Educator
URL: http://www.nimbios.org/wordpress-training/cellbiology/

Title: NIMBioS Twitter
URL: https://twitter.com/nimbios
Short Description of the Website:
The NIMBioS Twitter account is an interactive social media site that features 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
Short Description of the Website: NIMBioS Facebook page is an interactive social media site that features NIMBioS news, events and photos of interest to the NIMBioS Facebook community.

Title: NIMBioS Storify
URL: http://storify.com/NIMBioS
Short Description of the Website: 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/
Short Description of the Website: The NIMBioS Flickr features sets of posed and candid photos from various NIMBioS activities and events.

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

Media Coverage

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Addendum to NIMBioS Annual Report

Sep 1, 2016 –Aug 31, 2017

Y9-6. NSF Budget Office Reporting Requirement: Institutions, Partners, Participants

NSF Budget Office Reporting Requirement: institutions, partners, participants

The NSF Budget Office requests information from all synthesis centers on number of participating institutions, partners, and participants where participating institutions includes all academic institutions that have faculty/staff or students who participated in a NIMBioS activity during the year; number of partners is the total number of non-academic participants, including those from industry, states, and other federal agencies; and number of participants is the total number of people who used NIMBioS facilities during the reporting period, not just those directly supported by NSF. Note that total participants does not include the many participants in educational activities, including K-12, because we do not track those participants individually.

Table 1 includes NIMBioS data from the previous three reporting periods as well as data through April 30th, 2017 for the current reporting period. The NIMBioS Annual Report is submitted before 8/31/2017, the end of the reporting period, so data for the current reporting period only include the period from 9/1/2016-4/30/2017; they do not include projections for activities occurring between 5/1/2017-8/31/2017. Subsequent annual reports will include updated values for each previous reporting period.

Table 1. Number of participating institutions, partners, and participants at NIMBioS

Reporting Period	Academic institutions	Partners	Total participants
9/1/2013 - 8/31/2014	230	28 [b]	1123 (922 indiv.)
9/1/2014 - 8/31/2015	239	69 [c]	944 (751 indiv.)
9/1/2015 - 8/31/2016	232	51 [d]	917 (649 indiv.)
9/1/2016 - 4/30/2017 [a]	194	52 [e]	734 (572 indiv.)

[a] Numbers reported here only include the period from 9/1/2016-4/30/2017; they do not include projections for activities occurring between 5/1/2017-8/31/2017.

[b] 10 business/industry, 9 federal, 8 non-profit, 1 state

[c] 16 business/industry, 28 federal, 24 non-profit, 1 state

[d] 10 business/industry, 27 federal, 9 non-profit, 5 other

[e] 13 business/industry, 18 federal, 15 non-profit, 1 state, 5 other