Evaluation Report

Biological Problems Using Binary Matrices Working Group

Meeting 3: May 4-7, 2010

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June, 2010

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Executive Summary

Brief Synopsis of Event

This report is an evaluation of a NIMBioS Working Group entitled "Biological Problems Using Binary Matrices," (Binary Matrices) which held its third meeting at NIMBioS May 4-7, 2010. NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics. 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. NIMBioS 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. Working Groups will typically meet 2-3 times over a two-year period, with each meeting lasting 3-5 days; however, the number of participants, number of meetings, and duration of each meeting is flexible, depending on the needs and goals of the group.

The third meeting of the Binary Matrices group comprised eight participants, including organizers Edward F. Connor (Department of Biology, San Francisco State University, San Francisco, CA) and Joshua Ladau (Gladstone Institutes, GICD, San Francisco, CA). Participants came from a variety of other institutions, including the United States Geological Survey and the Integrative Ecology Group (non-profit), as well as several universities in Spain and the United States (See Appendix A).

The first meeting of the Binary Matrices Working Group brought together ecologists, mathematicians, and statisticians to tackle the problems arising from the current null model testing of binary matrices. The Working Group assembled to explore the statistical issues surrounding the use of binary matrices in interpreting large-scale data, and to develop a mathematical solution to the questionable results of null model testing.

The second meeting of the Binary Matrices Working Group began with presentations from the four subgroups (the analysis of food webs; pollination networks; incidence-based co-occurrence patterns; and abundance-based co-occurrence patterns), and discussions about the progress that had been made since the last meeting. Following the presentations, the subgroups worked to further their projects. Substantial progress was made acquiring data sets for analysis, coding statistical methods, and discussing data-related matters and models.

At the time of writing, the Working Group organizers have not submitted a summary of the third meeting activities.

Evaluation Design

An electronic survey aligned to the following evaluation questions was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director and Deputy Director:

1. Were participants satisfied with the format and organization of the Working Group?
2. Were participants satisfied with the Working Group overall?

3. Do participants feel the Working Group made adequate progress toward its stated goals?
4. Do participants feel they have a good understanding about the work being done by other subgroups within the group?
5. Do participants feel they gained a better understanding of how the work of the various subgroups will tie together to reach the Working Group's goals?
6. In what ways have Working Group collaborations differed from participants' other research collaborations?
7. In what ways are participants communicating between group meetings?

An electronic survey aligned to the evaluation questions was designed by the NIMBioS Evaluation Coordinator with input from the NIMBioS Director and Deputy Director. The final instrument was hosted online via the University of Tennessee's online survey host mrInterview. Links to the survey were sent to five Working Group participants on May 7, 2010 (organizers Edward Connor and Josh Ladau, along with NIMBioS affiliate William Godsoe were not included in the evaluation). Reminder emails were sent to non-responding participants on May 20, 2010. By May 25, 2010, three participants had given their feedback, for a response rate of 60%.

Highlights of Results

- Two of the three respondents indicated they were very satisfied with the Working Group overall, while one reported feeling neutral.

- All respondents indicated being satisfied with the diversity of disciplinary expertise of the Working Group participants.

- All respondents agreed that participating in the Working Group meeting increased their understanding of the work being done in by others in the group, while only two agreed they had a better understanding of how everyone's work would come together to achieve the goals of the group.

- All respondents said they felt the expectations for the next Working Group meeting are clear, in the sense that they were leaving this meeting with a good idea of what they needed to accomplish before the next meeting.

- The most common form of communication among respondents outside of meetings was email, followed by Skype.

- Respondents indicated the greatest differences between their collaborations within the Working Group and their other research collaborations were in the disciplinary topics involved, research methods used, and scientific questions addressed.

Conclusions and Recommendations

Overall, respondents felt Working Group was very successful in making progress toward its goals. Two of the three respondents indicated they were very satisfied with the Working Group overall, while one reported feeling neutral. All respondents indicated being satisfied with the diversity of disciplinary expertise of the Working Group participants.

Respondents indicated the greatest differences between their collaborations within the Working Group and their other research collaborations were in the disciplinary topics involved, research methods used, and scientific questions addressed.

All respondents agreed that participating in the Working Group meeting increased their understanding of the work being done in by others in the group, while only two agreed they had a better understanding of how everyone's work would come together to achieve the goals of the group

All respondents said they felt the expectations for the next Working Group meeting are clear, in the sense that they were leaving this meeting with a good idea of what they needed to accomplish before the next meeting.

Because of the low response rate, no recommendations can be made on the available data.

Binary Matrices Working Group Evaluation Report

Background

The Biological Problems Using Binary Matrices (Binary Matrices) Working Group comprised eight participants, including organizers Edward F. Connor (Department of Biology, San Francisco State University, San Francisco, CA) and Joshua Ladau (Gladstone Institutes, San Francisco, CA). Participants came from a variety of other institutions, including the United States Geological Survey and the Integrative Ecology Group (non-profit), as well as several universities in Spain and the United States (See Appendix A).

NIMBioS Working Groups are chosen to focus on major scientific questions at the interface between biology and mathematics. 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. NIMBioS 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. Working Groups will typically meet 2-3 times over a two-year period, with each meeting lasting 3-5 days; however, the number of participants, number of meetings, and duration of each meeting is flexible, depending on the needs and goals of the group.

The Binary Matrices Working Group brought together ecologists, evolutionary biologists, and statisticians to develop a mathematical solution to the inaccurate results spawned from using null model testing, which is based on intuition. For years, scientists have attempted to answer fundamental ecological questions using null model testing. Trying to measure the distribution of a species over time or geographical space, studying food webs and pollinator networks, or investigating the components of an ecosystem, however, pose serious problems for scientists using null models. The Binary Matrices Working Group plans to develop a new mathematical methodology for accurately studying and recording large-scale temporal-spatial data.

Participant Demographics

Meeting participants were college/university faculty (50%), government employees (12%) or postdoctoral researchers (38%). Primary fields of study for the eight participants included biological/biomedical sciences and mathematics (Table 1).

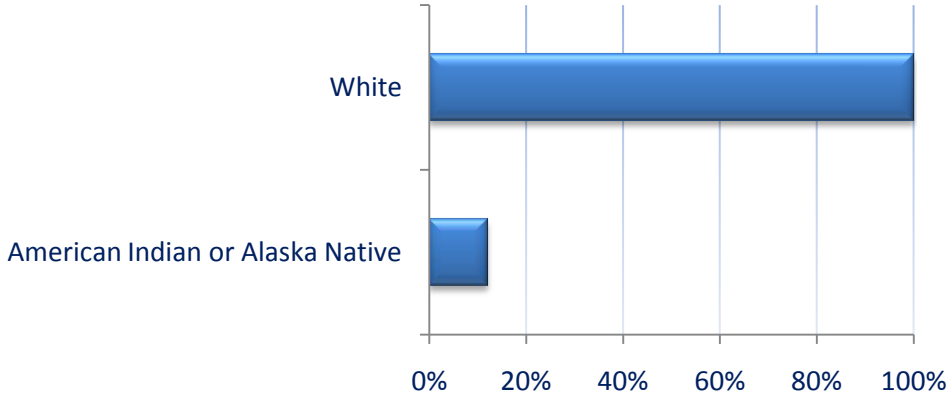
Table 1. ***Participant fields of study and areas of concentration***

Field of Study	Concentration	# Participants
Biological/Biomedical Sciences	Biometrics & Biostatistics	1
	Ecology	4
	Evolutionary Biology	1
	Mathematical Ecology	1
Mathematics	Statistics	1

Participants represented eight different institutions across Spain and the United States. Within the U.S., six different states were represented. Of the four different colleges/universities, all were classified as comprehensive (having undergraduate and graduate programs) schools.

The eight males (none of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figures 1).

Figure 1. ***Racial composition of program participants (n=8)***



Evaluation Design

Evaluation Questions

The evaluation of the Meeting was both formative and summative in nature, in that the data collected from participants was intended to both gain feedback from participants about the quality of the current Meeting and also to inform future meetings. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994[1]). Several questions constituted the foundation for the evaluation:

1. Were participants satisfied with the format and organization of the Working Group?
2. Were participants satisfied with the Working Group overall?
3. Do participants feel the Working Group made adequate progress toward its stated goals?
4. Do participants feel they have a good understanding about the work being done by other subgroups within the group?
5. Do participants feel they gained a better understanding of how the work of the various subgroups will tie together to reach the Working Group's goals?
6. In what ways have Working Group collaborations differed from participants' other research collaborations?
7. In what ways are participants communicating between group meetings?

[1] From Kirkpatrick, D.L. (1994). *Evaluating Training Programs: The Four Levels.* San Francisco, CA: Berrett-Koehler.

Evaluation Procedures

An electronic survey aligned to the evaluation questions was designed by NIMBioS' Evaluation Coordinator with input from the NIMBioS Director and Deputy Director. The final instrument was hosted online via the University of Tennessee's online survey host mrInterview. Links to the survey were sent to five Working Group participants on May 7, 2010 (organizers Edward Connor and Josh Ladau, along with NIMBioS affiliate William Godsoe were not included in the evaluation). Reminder emails were sent to non-responding participants on May 20, 2010. By May 25, 2010, three participants had given their feedback, for a response rate of 60%.

Data Analysis

Data from the electronic survey included both forced-response and supply-item questions. All data were downloaded from the online survey host into the statistical software package SPSS for analysis. Quantitative data were analyzed using SPSS, while qualitative data were analyzed in SPSS Text Analysis for Surveys. Qualitative responses were categorized by question and analyzed for trends.

Findings

Participant Satisfaction

Overall Satisfaction

Two of the three respondents indicated they were very satisfied with the Working Group overall, while one reported feeling neutral. While one participant indicated being dissatisfied with the organization of the meetings, another indicated he/she "found the meeting very well organized." See Table 2 for participant satisfaction with various aspects of the Working Group.

Table 2. ***Participant satisfaction with various aspects of the Working Group***

Please indicate your level of satisfaction with the following aspects of the Working Group:	*n*	Very satisfied	Satisfied	Neutral	Dissatisfied	Strongly dissatisfied
The amount of effort I spend on Working Group activities	3	67%%	0%	33%	0%	0%
The adherence of meetings to schedules	3	67%	0%	33%	0%	0%
Utilization of time during meetings	3	67%	0%	33%	0%	0%
Organization of the meetings	3	33%	0%	33%	33%	0%
The diversity of disciplinary expertise of the participants	3	67%	33%	0%	0%	0%
The level of task productivity of participants	3	33%	33%	33%	0%	0%
The quality of participant discussions and ideas	3	67%	0%	33%	0%	0%
Overall satisfaction level with the Working Group	3	67%	0%	33%	0%	0%

Working Group Format and Content

Progress Toward Goals

Two of the three respondents indicated they were very satisfied with the Working Group overall, while one reported feeling neutral. The respondent who disagreed had this to say:

> *"There tends to be far more discussion rather than work towards clear objectives. It is hard to see us reaching a clear set of deliverables."*

All respondents agreed that participating in the Working Group meeting increased their understanding of the work being done in by others in the group, while only two agreed they had a better understanding of how everyone's work would come together to achieve the goals of the group (Table 4).

Table 3. ***Participant understanding of Working Group structure and function***

As a result of participating in this Working Group, I have a better understanding of:	*n*	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The work being accomplished by the other subgroups within the Working Group.	3	33%	67%	0%	0%	0%
How the work of the various subgroups will tie together for the Working Group's publication(s) and/or product(s)	3	33%	33%	33%	0%	0%

Clarity of Expectations

All respondents said they felt the expectations for the next Working Group meeting were clear, in the sense that they were leaving this meeting with a good idea of what they needed to accomplish before the next meeting.

Communications

The most common form of communication among respondents outside of meetings was email, followed by Skype. Two respondents indicated they had never used the Wiggio to communicate with the group, and no respondents had met in person outside of Working Group meetings (Table 4).

Table 4. ***Communication between Working Group members outside meetings***

Outside of the meetings held at NIMBioS, in which of the following ways do you communicate with the other members of the Working Group?	*n*	Often	Sometimes	Rarely	Never
Email	3	67%	33%	0%	0%
Phone	3	0%	33%	33%	33%
In-person meetings	3	0%	0%	0%	100%
Tele/video conference	3	0%	33%	33%	33%
Skype	3	0%	67%	0%	33%
Wiggio	3	0%	33%	0%	67%

Collaboration Activities

NIMBioS is interested in know how Working Group research collaborations might differ from participants' other research collaborations. Respondents indicated the greatest differences were in the disciplinary topics involved, research methods used, and scientific questions addressed (Table 5).

Table 5. ***Working Group research collaborations***

In what ways do your Working Group collaborations differ from other research collaborations:	*n*	Much different	Slightly Different	Not Different
Scientific questions addressed	3	33%	67%	0%
Disciplinary topics involved	3	67%	33%	0%
Research methods used	3	67%	0%	33%
Competitive grants applied for	3	33%	33%	33%
Journals targeted for publication	3	33%	0%	67%
Academic conferences at which research is presented	3	33%	0%	67%

Conclusions and Recommendations

Overall, respondents felt Working Group was very successful in making progress toward its goals. Two of the three respondents indicated they were very satisfied with the Working Group overall, while one reported feeling neutral. All respondents indicated being satisfied with the diversity of disciplinary expertise of the Working Group participants.

Respondents indicated the greatest differences between their collaborations within the Working Group and their other research collaborations were in the disciplinary topics involved, research methods used, and scientific questions addressed.

All respondents agreed that participating in the Working Group meeting increased their understanding of the work being done in by others in the group, while only two agreed they had a better understanding of how everyone's work would come together to achieve the goals of the group

All respondents said they felt the expectations for the next Working Group meeting are clear, in the sense that they were leaving this meeting with a good idea of what they needed to accomplish before the next meeting.

Because of the low response rate, no broad recommendations can be made on the available data.

Appendix A

List of Participants

Participants

Last name	First name	Institution
Allesina	Stefano	NCEAS
*Connor	Edward	San Francisco State University
Dorazio	Robert	University of Florida
Godsoe	William	NIMBioS
*Ladau	Josh	Gladstone Institutes
Schwager	Steven	Cornell University
Simberloff	Daniel	University of Tennessee, Knoxville
Stouffer	Daniel	Estacion Biologica de Donana, Spain

* Organizer of Working Group

Participants who attended the first and second Working Group meeting, but not the third

Last name	First name	Institution
Barker	Richard	University of Otago
Gotellie	Nicholas	University of Vermont
Kembel	Stephen	University of Oregon
Vazquez	Diego	Universidad Nacional de Cuyo

* Organizer of Working Group

Appendix B

Binary Matrices Working Group Survey, Meeting Three

Binary Matrices Working Group Survey
Third Meeting

Thank you for taking a moment to complete this survey. Your responses will be used to help measure the progress of your Working Group, and to improve future Working Groups hosted by the National Institute for Mathematical and Biological Synthesis. Information you supply on the survey about your opinions of the Working Group will be confidential, and results will be reported only in the aggregate.

Please check the appropriate box to indicate your level of overall satisfaction with the following aspects of the third Working Group meeting: (Very satisfied, Satisfied, Neither satisfied nor dissatisfied, Dissatisfied, Very dissatisfied)

The amount of effort I spend on Working Group activities
The adherence of meetings to schedules
The utilization of time during meetings
The organization of the meetings
The diversity of disciplinary expertise of the participants
The level of task productivity of participants
The quality of participant ideas and discussions
My overall satisfaction level with the Working Group

Please check the appropriate box to indicate your level of agreement with the following statements. As a result of participating in this Working Group, I have a better understanding of:
(Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

The work being accomplished by the other subgroups within the Working Group
How the work of the various subgroups will tie together for the Working Group's publication(s) and/or product(s)

Do you feel the Working Group made adequate progress towards its goals?

Yes
No
Comments:

Do you feel the expectations for the next Working Group meeting are clear (in the sense that you are leaving this meeting with a good idea of what you need to accomplish before the next meeting)?

Yes
No
Comments:

Research collaborations are defined as two or more people who work towards a common research goal. In which of the following ways (if any) do your Working Group research collaborations differ from your other collaborations: (Much different, Slightly different, Not different)

Scientific questions addressed
Disciplinary topics involved
Research methods used
Competitive grants applied for
Journals targeted or publication
Academic conferences at which research is presented

Communications

Outside of the meetings held at NIMBioS, which of the following ways do you communicate with other members of the Working Group? (Often, Sometimes, Rarely, Never)

Email
Phone
In-person meetings
Tele/video conference
Skype
Wiggio

Appendix C

Open-ended Survey Responses

Open-ended responses, by question and response category

Do you feel the Working Group made adequate progress toward its goals? Comments: (n=1)

There tends to be far more discussion rather than work towards clear objectives. It is hard to see us reaching a clear set of deliverables.

Do you feel the expectations for the next Working Group meeting are clear (in the sense that you are leaving this meeting with a good idea of what you need to accomplish before the next meeting)? Comments: (n=0)

Please provide any additional comments about your overall experience with the Working Group: (n=0)

Please provide any additional comments about the overall organization of the Working Group: (n=1)

I found the meeting very well organized

In which of the following ways (if any) do your Working Group research collaborations differ from your other collaborations? (n=0)

Other mode of communication used: (n=0)