



# Evaluation Report

## Integrating Functional and Evolutionary Dynamics at Multiple Scales Working Group Meeting 2: March 1-3, 2010

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## Executive Summary

### Brief Synopsis of Event

This report is an evaluation of a NIMBioS Working Group entitled “Integrating Functional and Evolutionary Dynamics at Multiple Scales” (Function and Evolution), which held its second meeting at NIMBioS March 1-3, 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 second meeting of the Function and Evolution group comprised eight participants, including organizers Erol Akcay (NIMBioS) and Joan Roughgarden (Stanford University). Two participants from the first meeting of the working group were not present at the second meeting, and all of the participants in the second meeting attended the first.

### 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 Working Group overall?
2. Did the meeting meet participant expectations?
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. What impact has the working group had on participants’ research agendas?
7. Were participants satisfied with communication between group meetings?

The final instrument was hosted online via the University of Tennessee’s online survey host mInterview. Links to the survey were sent to five Working Group participants on March 4, 2010 (organizers Erol Akcay and Joan Roughgarden, along with NIMBioS affiliate Louis Gross were not included in the evaluation). Reminder emails were sent to non-responding participants on March 11, 2010. By March 18, 2010, three participants had given their feedback, for a response rate of 60%.

## Highlights of Results

- Overall satisfaction with the Working Group was high among respondents, 100% of whom indicated they either agreed or strongly agreed that the Working Group was very productive and met their expectations.
- 67% of respondents thought the presentations were useful, and all thought that the presenters were very knowledgeable about their presentation topics.
- 100% of respondents agreed that participating in the working group meeting increased their understanding of the work being done in by others in the group.
- 67% of respondents agreed that participating in the meeting increased their understanding of how everyone's work would come together to achieve the goals of the group.
- 67% of respondents agreed that the format of the Working Group was very effective for achieving its goals.
- 100% of respondents said that the Working Group made adequate progress toward reaching its intended goals.
- 100% of respondents said that participating in the working had influenced their research agendas.
- 67% of respondents said they left this meeting with a good idea of what their contribution will be at the next meeting.

## Conclusions and Recommendations

Overall, the Working Group appears to be successful in making progress toward its goals. Working Group respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations.

All respondents agreed that participating in the working group meeting increased their understanding of the work being done in by others in the group, and two of the three agreed they better understood how everyone's work would come together to achieve the goals of the group. One respondent indicated the most beneficial aspect of the working group was the group discussions. Two of the three 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.

All respondents said that participating in the working had influenced their research agendas. Respondents said that being part of the working group has caused them to think about incorporating research related to the working group's topic into their own research.

Respondents offered no suggestions for improving the content, format, or communications within the group.

No recommendations are made for the group at this time.

# Function and Evolution Working Group Evaluation Report

## Background

The Function and Evolution Working Group's second meeting comprised eight participants, including organizers Erol Akcay (NIMBioS) and Joan Roughgarden (Stanford University). Two participants from the first meeting of the working group were not present at the second meeting, and all of the participants in the second meeting attended the first. Participants came from several universities in 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 group is working to model the dynamics of biological systems at the functional and evolutionary levels, and integrate these two in a unified framework. From cells to human societies, biological organization emerges from the interaction of individual parts. The dynamics of these interactions are governed by the interaction mechanisms. Even though these mechanisms themselves are ultimately products of evolution, the functional dynamics they produce are not identical to the evolutionary dynamics and operate at different scales. In order to explain the emergence of biological organization, researchers need to integrate both functional and evolutionary dynamics.

The group is working to develop the theoretical framework for this task. Particular focal topics that will be addressed are: the evolution of pay-offs and trade-offs in biological interactions, the evolution of interaction mechanisms, and the modeling of the interplay between different types of functional dynamics. The working group will integrate the results from these focal investigations in a multi-scale theoretical framework and identify new avenues for theoretical and empirical research opened by this synthesis.

## Participant Demographics

Meeting participants were college/university faculty (75%) or postdoctoral researchers (25%). Primary fields of study for the eight participants included biological/biomedical sciences, humanities, and mathematics (Table 1).

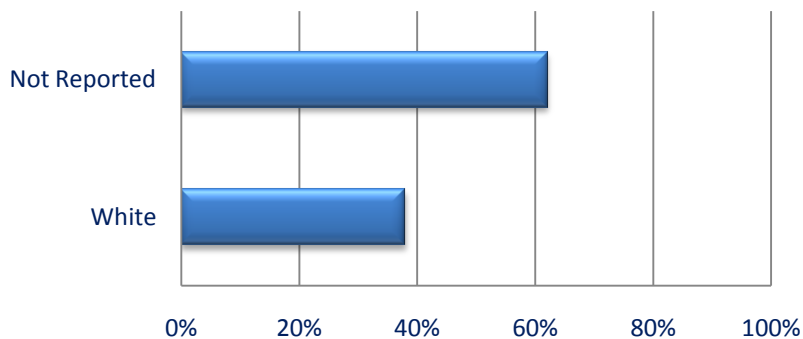
**Table 1. Participant fields of study and areas of concentration**

Field of Study	Concentration	# Participants
Biological/Biomedical Sciences	Biology/Biological Sciences, General	1
	Endocrinology	1
	Evolutionary Biology	3
	Mathematical Biology	1
Humanities	Humanities, General	1
Mathematics	Applied Mathematics	1

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

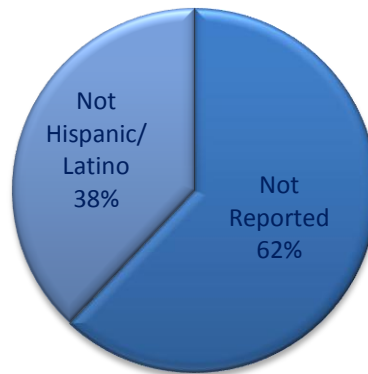
The three females and five males (none of whom self-identified as being of Hispanic/Latino ethnicity) mostly self-identified racially as white (Figures 1 & 2).

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





**Figure 2. Ethnic 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<sup>1</sup>). Several questions constituted the foundation for the evaluation:

1. Were participants satisfied with the Working Group overall?
2. Did the meeting meet participant expectations?
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. What impact has the working group had on participants' research agendas?
7. Were participants satisfied with communication between group meetings?

### Evaluation Procedures

The final instrument was hosted online via the University of Tennessee's online survey host mInterview. Links to the survey were sent to five Working Group participants on March 4, 2010 (organizers Erol Akcay and Joan Roughgarden, along with NIMBioS affiliate Louis Gross were not included in the evaluation). Reminder emails were sent to non-responding participants on March 11, 2010. By March 18, 2010, three participants had given their feedback, for a response rate of 60%.

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

## 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

Overall satisfaction with the Working Group was high among respondents, 100% of whom indicated they either agreed or strongly agreed that the Working Group was very productive and met their expectations. Two of the three respondents thought the presentations were useful, and all thought that the presenters were very knowledgeable about their presentation topics (Table 2).

**Table 2. Satisfaction with various aspects of the Working Group**

	<i>n</i>	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I feel the Working Group was very productive.	3	33%	67%	0%	0%	0%
The Working Group met my expectations.	3	100%	0%	0%	0%	0%
The presenters were very knowledgeable about their topics.	3	100%	0%	0%	0%	0%
The presentations were useful.	3	33%	33%	33%	0%	0%
The group discussions were useful.	3	33%	67%	0%	0%	0%

#### Progress Toward Goals

Two of the three respondents felt the format for the second meeting was effective for meeting its goals, while all felt that the group made adequate progress toward reaching its intended goals. The respondent who felt the format was not effective had this to say:

*“This group doesn't seem especially goal-oriented right now. Fruitful encounters are happening, which seems like a good outcome in itself.”*

All respondents agreed that participating in the working group meeting increased their understanding of the work being done in by others in the group, and two of the three agreed they better understood how everyone's work would come together to achieve the goals of the group (Table 3).

**Table 3. 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	67%	33%	0%	0%	0%
how the work of the various subgroups will tie together for the Function and Evolution group's publication(s) and/or product(s)	3	67%	0%	0%	33%	0%

**Most Useful Aspects**

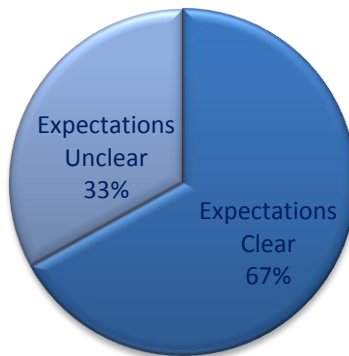
One respondent indicated the most beneficial aspect of the working group was the group discussions:

*“The small group discussions I was involved in were most beneficial, but the whole group discussions were also useful.”*

**Clarity of Expectations**

Two of the three 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 (Figure 3).

**Figure 3. Clarity of expectations for the next working group meeting**



**Working Group Impact**

**Participant Research**

All respondents said that participating in the working group had influenced their research agendas. Respondents said that being part of the working group has caused them to think about incorporating research related to the group’s topic into their own research:

*“I’ve benefited from exposure to new ideas and encouragement for my own work.”*

*“Definitely made me think in several new channels - good way to infuse creativity into my research program.”*

*“It's given me a couple of new collaborations and several new research ideas.”*

### **Suggestions for Future Working Group Meetings**

Respondents were asked several questions soliciting ideas for improving working group meetings with regard to content, format, and communications. No suggestions were made by the respondents.

### **Conclusions and Recommendations**

Overall, the Working Group appears to be successful in making progress toward its goals. Working Group respondents were satisfied with the meeting, indicating that it was a productive experience that met their expectations.

All respondents agreed that participating in the working group meeting increased their understanding of the work being done in by others in the group, and two of the three agreed they better understood how everyone's work would come together to achieve the goals of the group. One respondent indicated the most beneficial aspect of the working group was the group discussions. Two of the three 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.

All respondents said that participating in the working had influenced their research agendas. Respondents said that being part of the working group has caused them to think about incorporating research related to the working group's topic into their own research.

Respondents offered no suggestions for improving the content, format, or communications within the group.

No recommendations are made for the group at this time.

## **Appendix A**

### ***List of Participants***

## Participants

Last name	First name	Institution
*Ackay	Erol	NIMBioS
Brown	Joel	University of Illinois, Chicago
Gross	Louis	NIMBioS
Iyer	Priya	Stanford University
McGill	Brian	University of Arizona
Potochnik	Angela	Oklahoma State University
*Roughgarden	Joan	Stanford University
Worden	Lee	University of California, Berkeley

\* Organizer of Working Group

† Not present at first working group meeting

## Participants who attended the first working group meeting, but not the second

Last name	First name	Institution
Gintis	Herbert	Santa Fe Institute
Vanden-Eijnden	Eric	New York University

\* Organizer of Working Group

## **Appendix B**

*Function and Evolution Working Group Survey, Meeting Two*

## Function and Evolution Working Group Survey Second 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 agreement with the following statements about the second Working Group meeting: (Strongly agree, Agree, Neutral, Disagree, Strongly disagree)

- I feel the meeting was very productive.
- The meeting met my expectations.
- The presenters were very knowledgeable about their topics.
- The presentations were useful.
- The group discussions were useful.

How do you feel about the format of the working group?

- This was a very effective format for achieving our goals.
- This was not a very effective format for achieving our goals.
- The working group format would have been more effective if:

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, for its second meeting, toward reaching its intended 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:

What aspect of this meeting of the Working Group did you feel was the most beneficial in advancing the group's research agenda? (e.g. discussions with the whole group/small groups, opportunity to resolve technical difficulties, or a particular activity)

What, if anything, would you change about the Working Group meeting?

How has participating in the Working Group influenced your research agenda thus far?

### **Communications**

What, if anything, do you feel your Working Group organizers can do to better facilitate communication/collaboration among group members between meetings?

## **Appendix C**

### ***Open-ended Survey Responses***

## Open-ended responses, by question and response category

**Do you feel the Working Group made adequate progress, for its second meeting, toward meeting the group's overall goals? (n=0)**

**How has participating in the Working Group influenced your research agenda thus far? (n=3)**

I've benefited from exposure to new ideas and encouragement for my own work.

Definitely made me think in several new channels - good way to infuse creativity into my research program.

It's given me a couple of new collaborations and several new research ideas.

**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?): (n=1)**

This group doesn't seem especially goal-oriented right now. Fruitful encounters are happening, which seems like a good outcome in itself.

**What, if anything, would you change about the Working Group meeting? (n=1)**

If we had had a bit more realistic plan from the beginning, it seems we would have spent less time spinning our wheels.

**The Working Group format would be more effective if: (n=0)**

**Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to Working Group participants (n=0)**

**Please provide any additional comments about your overall experience with the working group: (n=0)**

**What aspect of this meeting of the Working Group did you feel was the most beneficial in advancing the group's research agenda? (n=1)**

The small group discussions I was involved in were most beneficial, but the whole group discussions were also useful.

**What, if anything, do you feel your Working Group organizers can do to better facilitate communication/collaboration among group members between meetings? (n=0)**