



Evaluation Data Report

Investigative Workshop: *Synchronous Activity in Biological Systems*

April 11-13, 2011

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Synchronous Activity in Biological Systems

Evaluation Data Report

Background

Introduction

This report contains evaluation data for a NIMBioS Investigative Workshop entitled “*Synchronous Activity in Biological Systems*” (Synchrony workshop), which took place at NIMBioS April 11-13, 2011. NIMBioS Investigative Workshops are relatively large (30-40 participants), focus on a broader topic or a set of related topics than Working Groups, attempt to summarize/synthesize the state of the art and identify future directions, and have potential for leading to one or more future Working Groups. Participants may include post-docs and graduate students with less experience in the particular topic than those participating in Working Groups.

The Synchrony workshop comprised 34 participants, including co-organizers Alan Hastings (Environmental Science and Policy, University of California, Davis, CA), Tim Lewis (Department of Mathematics, University of California, Davis, CA), and Michael Bonsall (Department of Zoology, University of Oxford, Oxford, UK).

Workshop Background

Synchronous oscillatory activity and phase-locking in general are universal phenomena that occur in biological systems ranging from the level of intracellular dynamics to population dynamics across thousands of kilometers. The study of synchrony from a mathematical standpoint has had a very long history going back at least as far as Huygens in the 1600's. However, there are still many unanswered questions involving synchronization that are of central biological importance. The importance of synchrony in many different fields of biological and physical sciences has led to large bodies of literature on synchrony that have little cross-referencing. This workshop brought together a diverse group of researchers from mathematics and statistics and the biological sciences including ecology and neuroscience. Participants explored how ideas about the study of synchrony in one field can provide novel insights into questions of synchrony in another field. Participants also sought to identify what are real gaps in the theory of synchrony from a biological perspective and where progress will be possible.

Evaluation Design

Evaluation Questions

The evaluation of the workshop was both formative and summative in nature, in that the data collected from respondents was intended to both gain feedback from respondents about the quality of the current workshop and also to inform future similar meetings. The evaluation framework was guided by Kirkpatrick's Four Levels of Evaluation model for training and learning programs (Kirkpatrick, 1994¹). Several questions constituted the foundation for the evaluation:

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

Evaluation Procedures

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 mrlInterview. Links to the survey were sent to 27 registered workshop participants on April 14, 2011 (co-organizers and NIMBioS affiliates were not included in the evaluation). Reminder emails were sent to non-responding participants on April 19 and 25, 2011. By May 2, 2011, 24 of the participants had given their feedback, for a response rate of 89%.

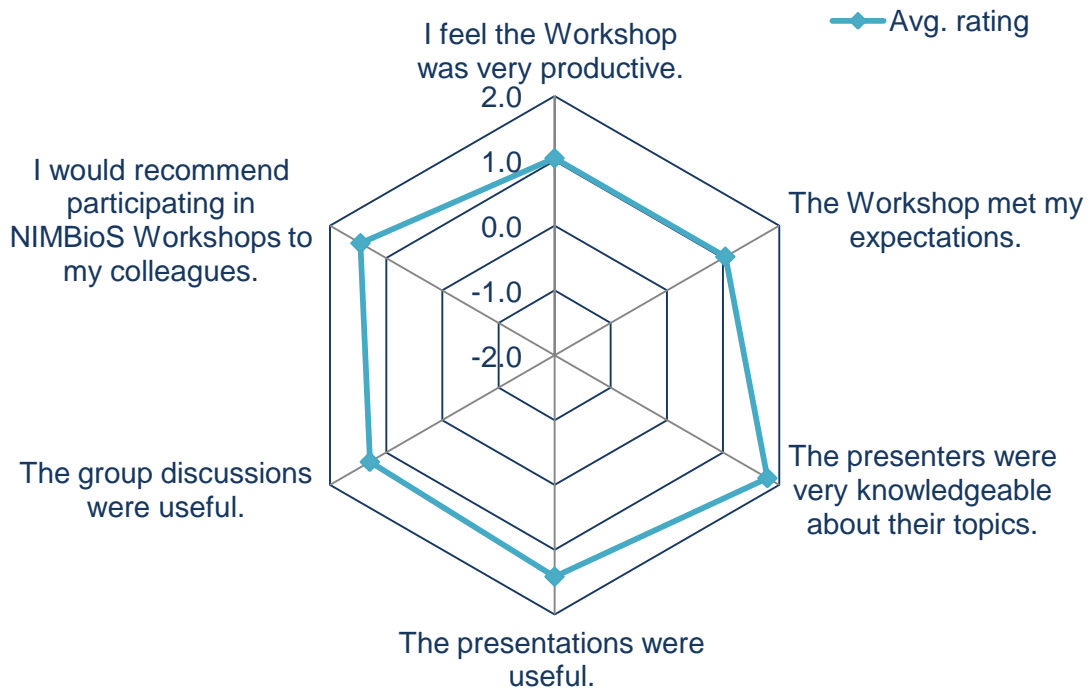
¹ From Kirkpatrick, D.L. (1994). *Evaluating Training Programs: The Four Levels*. San Francisco, CA: Berrett-Koehler.

Evaluation Findings

Satisfaction

Overall Satisfaction

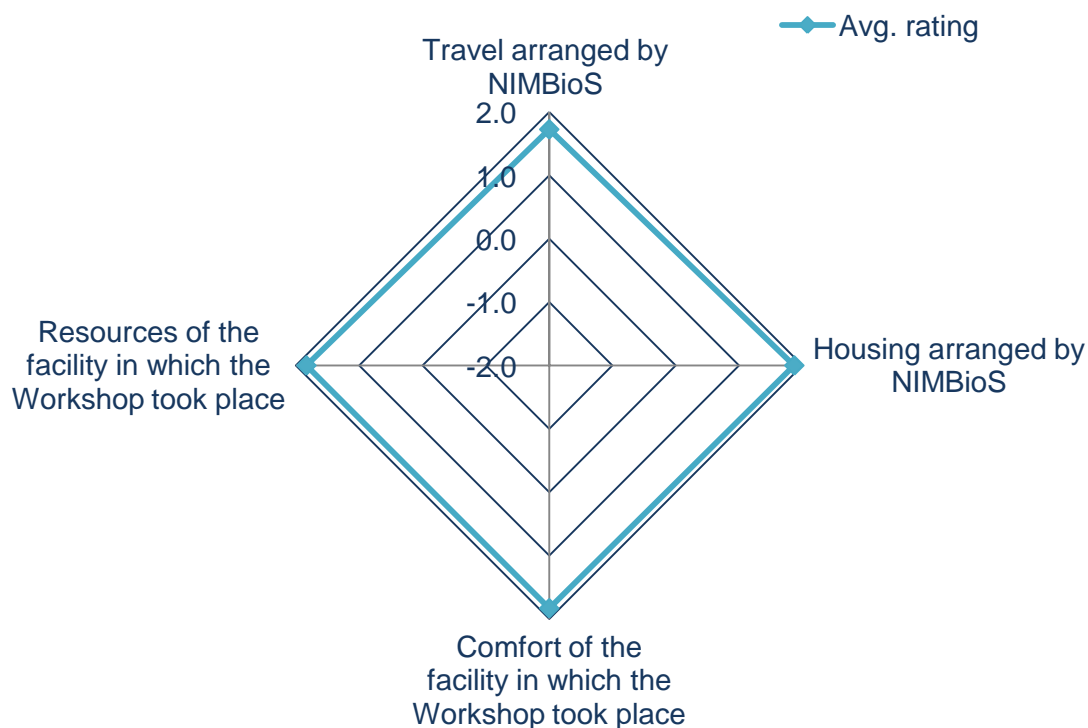
Figure 1. Satisfaction with various aspects of the workshop



Scored on a 5-point Likert scale from -2 to 2 for “strongly disagree” to “strongly agree”

Satisfaction with Accommodations

Figure 2. Satisfaction with accommodations



Scored on a 5-point Likert scale from -2 to 2 for “very dissatisfied” to “very satisfied”

Comments

Everything was excellent. I found the staff wonderful, friendly, and very kind.

It is perfect, but I would suggest the organizer could show us around the Univ. of Tenn. during the break, since we sit in the room from 8:30 to 6:30 all day.

There were direct flights, but were not arranged perhaps due to financial restraints. The internet at the hotel - Holiday Inn was extremely slow.

The wireless network was often overloaded, making it difficult to connect.

Any improvements I would suggest are actually already underway. I have nothing to add.

May be more working space available for attendees, that is, more conference rooms available where attendee can sit and discuss.

I think my flight could have been arranged earlier so that I did not need to take many connections. Since it was bought a bit late, only flights with many connections were available at a good price.

Decaf coffee please. :)

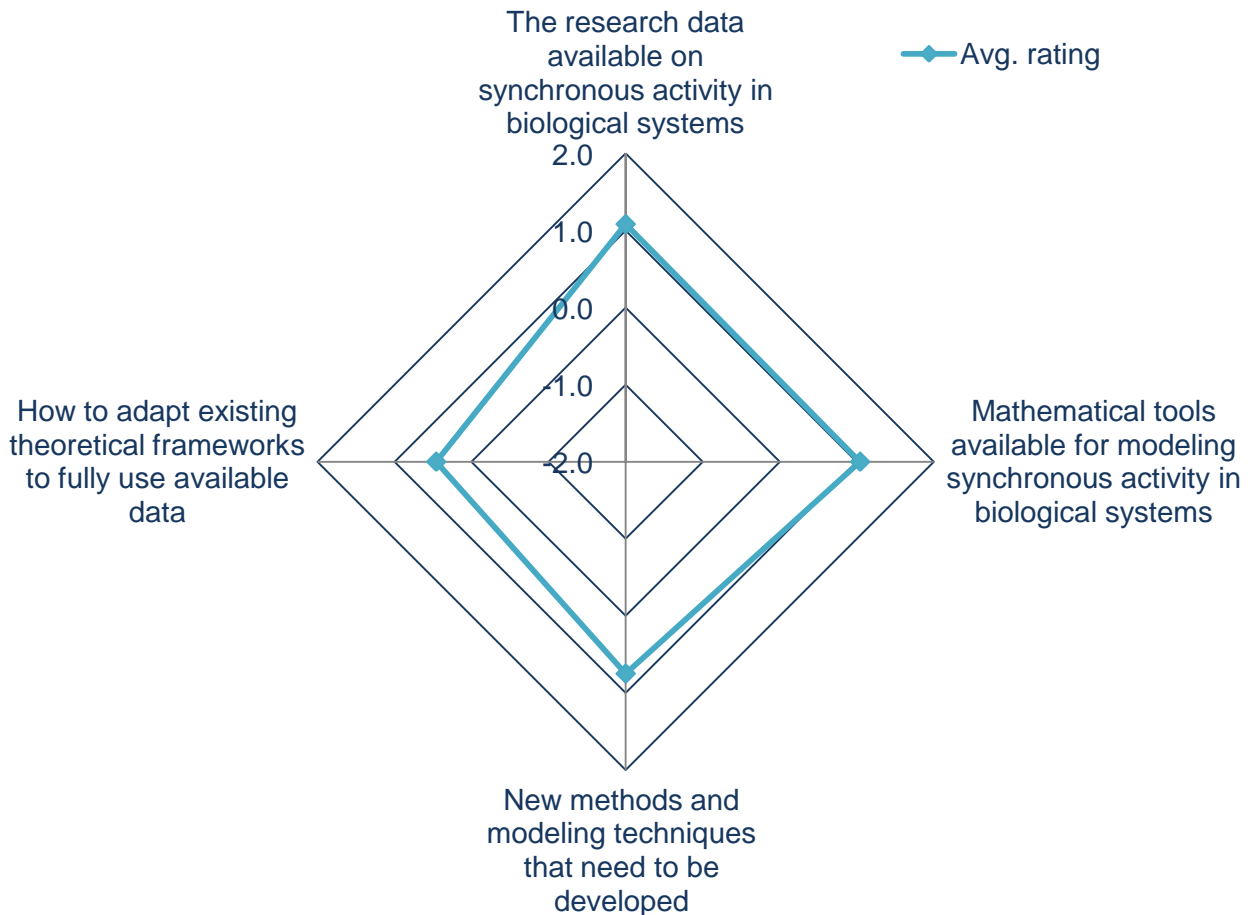
Better seating arrangement.

Workshop Content and Format

Participant Learning

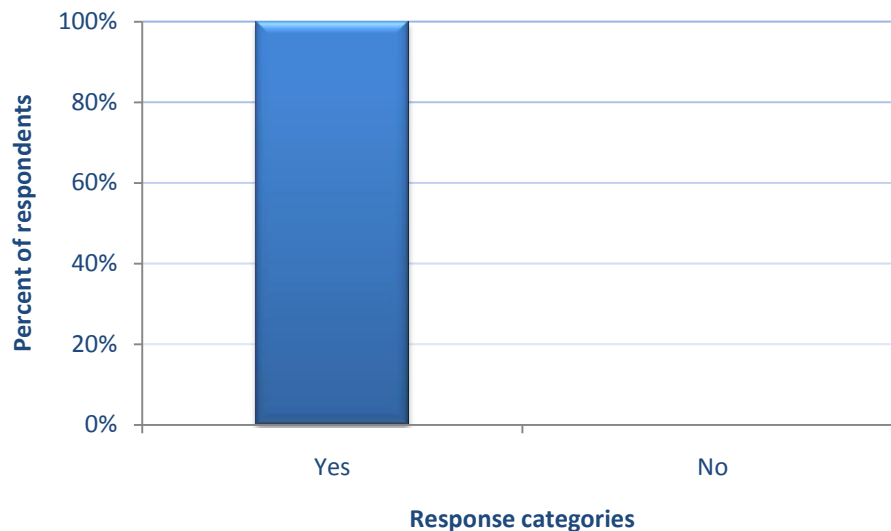
Figure 3. Participant learning

As a result of attending this workshop, I have a better understanding of:



Scored on a 5-point Likert scale from -2 to 2 for “strongly disagree” to “strongly agree”

Figure 4. Do you feel that participating in the workshop helped you better understand the research going on in disciplines other than your own regarding synchrony in biological systems?



Comments

More talks with actual biological data would have been useful.

For the most part, the discussion focused on fundamental issues and I didn't get too deep an insight into how synchrony mechanisms are actually modeled in various applications.

I enjoyed the variety of disciplines represented at the workshop but also felt this caused "philosophical" differences during small group discussions that could not be overcome. Perhaps a narrower focus for small group discussions and more presentations to pass the knowledge base from each discipline to the other disciplines. Presentations and discussions intermixed, so that the previous presentation could be the topic of discussion (clarification of what was presented, or an attempt to apply what was presented to a problem, or "solve" a problem that was presented).

I have a better understanding of what other fields mean by synchrony. However, I felt there was little done to integrate these ideas across biological scales.

I think the interdisciplinary backgrounds of the participants were the strength of the workshop. It made it a very unique experience.

I am an ecologist, but I learned a lot from neurobiologists and mathematicians.

I developed a deeper understanding of issues in ecology which I would not have had otherwise. Similarly, I could appreciate the challenges in arriving at

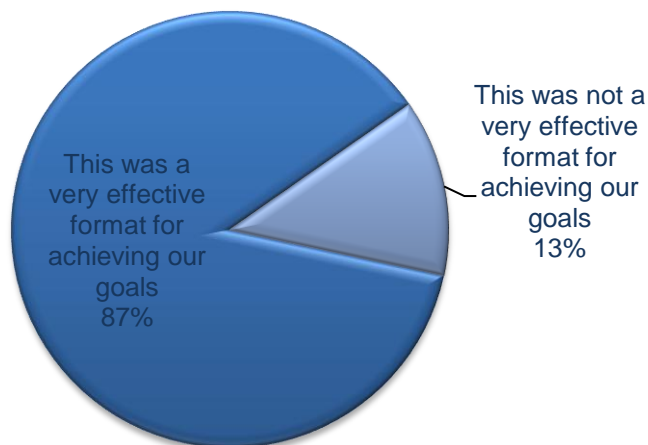
the right mathematical abstractions in the domain of synchrony.

Mostly the work in neuroscience and ecology

The workshop introduced me to several different systems of synchronous behavior in biology, widely outside of my former range. I think that this could have profound implications for my research, but that remains to be seen and will depend on a variety of circumstances. None the less, it is clear that NIMBioS and this workshop in particular are extraordinary tools and could be deeply valuable to many of us.

Workshop Format

Figure 5. Effectiveness of workshop format



The format would have been more effective if:

There were group leaders/scribes, who summarized in written form what had been discussed.

There were more presentations to help bridge the gap between disciplines. A mathematical answer to "what is synchrony?" is very different from a biologist's definition, but the two need to be understood to create a useful working definition for both sides. Presentations of "here is my data and we can't understand it because there is no tool to be able to do (insert problem)". As well as presentations of tools which have been successfully applied to other synchronization problems.

Most Useful Aspects of Workshop

It provides different ideas and view.

Bringing together people from different disciplines, who study the same phenomena (synchronization) and are interested in the same methods

Exchange of ideas with people in different scientific field.

The workshop was well balanced with participants from mathematics, ecology and neuroscience. I got a chance to hear about fundamental issues that spanned these disciplines, such as the basic concepts underlying a definition of synchrony.

Meeting and interacting with a diverse range of participants from various disciplines.

Interdisciplinary background of participants.

All discussions with people from different disciplines.

Being exposed to the wide variety of research problems that are being tackled as "synchrony" problems, but essentially the biological questions are case specific.

Got insight in this issue, and also, knew- how other field's people are looking at this topic

Building connections with the community

I appreciated the talks at the beginning to give an overview of how synchrony is used in separate fields. I also felt that the group discussion times were valuable.

Presentation and discussion of the theoretical framework upon which to build analysis of synchronous behavior ACROSS biological systems

Presentations

The small group discussions (~10 people) with people from other disciplines to really understand their take on a problem, and what is of interest in their respective fields.

Small group discussions and following synthesis.

The emphasis on break-up group to discuss topics and generate ideas rather than the traditional, focus on lectures. Also, it was very useful the open discussions leading to issues for breakout groups as well as the breakout group meetings, in which the different groups shared

conclusions/comments/questions, arose within individual groups.

The short talks and questions that followed

Getting to understand that the word synchrony was not as simple as I had thought.

The talks were very useful, and it was useful that there weren't very many of them because the discussions were also useful.

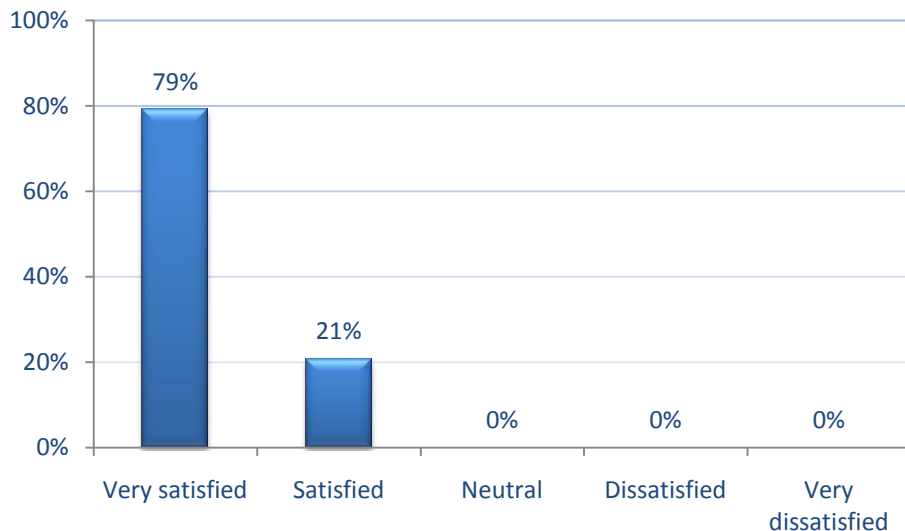
Having time to interact with other researchers with similar interests.

Time to interact closely with a lot of researchers with similar but different enough interests and backgrounds.

It was extremely informative and a fabulous opportunity to learn more about synchrony in other fields -- and my own. The discussions were candid, respectful, and enlightening. Statistical/theoretical examples were useful and helped me better understand the more subtle aspects of the discussions. Also a great networking opportunity!

Communication

Figure 6. How satisfied were you with the opportunities provided during workshop presentations and discussions to ask questions and/or make comments?



Comments

I think communication was open. However, I think in this particular group, there was a heavy bias to mathematicians, or ecology/neural biologists. For anyone not in that group, it was difficult to convey ideas and have meaningful

discussion since there was such a bias away from those ideas.

It would be nice if larger tables could be provided for breakfast and lunch to facilitate discussions.

As I indicated earlier, it would be good to circulate a list of participants, and a 1 page description of their interest in the workshop, say 1-2 weeks before the event.

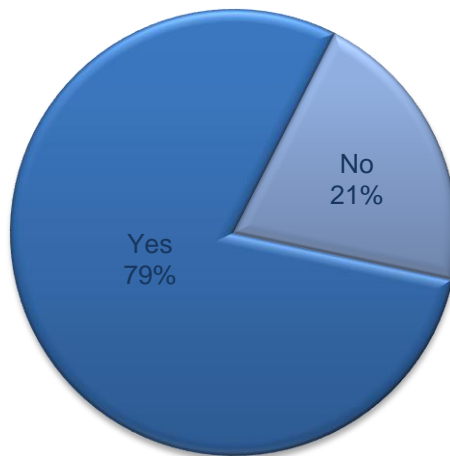
More time for discussion after presentations

Provide a phone list for participants to reference during the workshop.

I think communication was open. However, I think in this particular group, there was a heavy bias to mathematicians, or ecology/neural biologists. For anyone not in that group, it was difficult to convey ideas and have meaningful discussion since there was such a bias away from those ideas.

Progress Toward Goals

Figure 7. Do you feel the workshop made adequate progress toward finding a common language across disciplines for research on the workshop's topic?



Comments

I answered "yes," but I feel neutral about this. Although I have a better understanding of how synchrony is described/defined in other disciplines, the best approach at this point seems to be to continue to provide an "operational" definition of synchrony when it is discussed in a given context. I don't feel that we are any closer to having a particularly useful "universal" definition -- but that really doesn't seem necessary, as long as we can effectively communicate

what we mean.

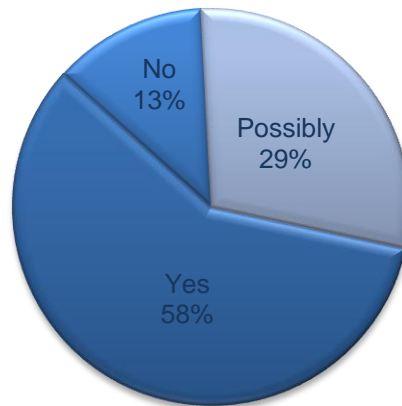
A success of the meeting was summarized in a good working definition of synchrony that worked for both experimentalists and theoreticians.

At least, it was good talking about the differences that still remain. Defining 'synchrony' in a satisfying manner for all disciplines might be impossible.

It appears that different disciplines (e.g. neuroscience, ecology) have their own expectations for what constitutes synchrony. It was useful to have a dialog between these two communities. It is hard to find such information captured in publications or books.

Impact on Future Research Plans

Figure 8. Do you feel that the exchange of ideas that took place during the workshop will influence your future research?



Comments

I have a clearer picture of what has been done and what needs to be done.

It was intellectually stimulating but it did not influence my research plan or my approach to studying and measuring synchrony.

The new definition of synchrony needs to be explored mathematically.

I am offering a tutorial at the IEEE International Conference on Neural Networks in July 2011, on the topic of understanding timing information in neural networks. Many of the ideas discussed during this workshop will form relevant subject matter for the tutorial, and I intend to use some of the examples that participants introduced. For instance, predator-prey and coral reef dynamics from ecology.

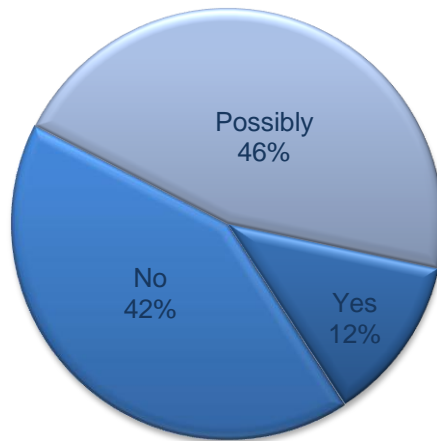
My understanding of synchrony has changed at a fundamental level and will help

me to address a variety of questions in my work over the next year or two. The implications and outcomes of this change will depend upon what I find in my current dataset and what options and opportunities are available to me in the near future.

Not in the sense that I would change my way of thinking about synchrony in ecological systems. Still, it's fine for me to use both approaches, oscillator theory and correlations, to describe synchrony in ecology. However, I will keep my eyes open for similar patterns among different biological disciplines.

Impact on Future Collaborations

Figure 9. Did you develop plans for collaborative research with other workshop participants?



Comments

I may continue to interact with some of the participants who have an interest in neuroscience, which matches my own interests.

I was one of the few non-ecological, non-neuronal researchers present. Therefore, no real collaborations were made. I think this was exacerbated by the fact that we did not settle on common ground of what synchrony actually is.

We are exploring some potential ideas, we shall know soon if it will actual bear fruit.

Will follow-up on potential research directions via email.

Not yet. But if anyone is interested to combine his/her work with theoretical ecology topics, it would be really nice.

But I did get papers relative to my own work from other participants and plan to talk again at upcoming conferences (SIAM DS11).

I believe that it is likely that I will be working with another individual from the workshop. We do not have concrete plans, but they are forming and we will be talking in the next few weeks about how to go about working with a dataset and some theory that I had not been aware of.

Suggestions for Future workshops

A clearer sum up in the end of each day.

I would suggest that we define synchrony at the outset. When trying to bring people together that may have different ideas, it is critical that you get everyone on the same page. Perhaps having everyone define synchrony during the intro would help to determine how much commonality or difference there is in all of our perceptions of synchrony. From this point, the discussions would be much better focused and understood by all participating.

More narrow focus for the small group discussions - present data and discuss a single problem, or a single (category) of mathematical tool(s). Leaving the first discussions open may help illuminate what topics people would like to discuss in future small groups.

It would be helpful to have more specific "charges" for the various breakout groups. Topics/questions were provided for discussion, but a little bit more structure might have facilitated more productive meetings.

I think the breakout group strategy it would more efficient with a smaller number of elements in each group.

Maybe identifying topics of discussion ahead of time maybe using Wiggio would help people think ahead of time and have more organized break discussion. I felt I often we missed out on topics or did not prioritize topics well enough.

Better way to choose group discussion topics

Focus the discussions a bit more. The questions posed were fine, and some of the breakout discussions were very satisfying. But in some, the discussion was dominated by one or a small set of people who were dwelling on a particular concern, which could mire the progress. It might have helped to have at least one organizer in each of the breakout sessions to help break such conversation locks. (Of course the participants could try to do this themselves -- and I tried -- but sometimes force of will wins out without appeal to some sort of governing or organizational authority.)

Probably a small amount of additional structure might have been useful.

Perhaps we could have spent a little more time understanding specific approaches to measuring and utilizing synchrony. I have a suggestion about getting participants oriented towards the workshop. It would be useful to have a list of participants, along with their research statements. We were asked to provide a brief description regarding our interest in the workshop anyway. So it should not be too difficult to just collate these and make them available. I recently attended an interdisciplinary meeting organized by the National Academy of Science, and found such a compilation very useful. You can contact me for further information if you wish (Ravi Rao, ravirao@us.ibm.com).

I would have liked to have more cell and molecular and developmental biologists represented.

I thought there would be stronger focus on data analytical approaches.

That is a very difficult question, but I think that I would have wanted to make it more concrete. Perhaps some data or models could have actually been addressed by the group or breakout groups.

It was good

Talk less about definition of the synchrony.

I got tired of going around in circles about what the definition of synchrony is. I'm not really sure that this could have been changed, since the organizers deliberately chose other topics for discussion. Nonetheless, we couldn't seem to help ourselves and almost every breakout group turned into another debate about the definition.

Additional Comments

I would recommend working on advertising these workshops to a broader audience. I heard about this through a colleague who works in ecology. To get more cell and molecular biologist participants, I would suggest advertising at big meetings like ASCB or large plant biology meetings to get a more diverse group in the future.

Thanks to all!!!!!!!!!!!!

Thanks. This was an extraordinary experience and I am deeply grateful for it.

Appendix

Synchronous Activity in Biological Systems Workshop Evaluation Survey

Synchronous Activity in Biological Systems Workshop Survey

Thank you for taking a moment to complete this survey. Your responses will be used to improve the workshops hosted by the National Institute for Mathematical and Biological Synthesis. Information supplied on the survey 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 this workshop: (Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied)

- I feel the workshop was very productive.
- The workshop met my expectations.
- The presenters were very knowledgeable about their topics.
- The presentations were useful.
- The group discussions were useful
- I would recommend participating in NIMBioS workshops to my colleagues.

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

- The research data available on synchronous activity in biological systems
- Mathematical tools available for modeling synchronous activity in biological systems
- New methods and modeling techniques that need to be developed
- How to adapt existing theoretical frameworks to fully use available data

Do you feel participating in the workshop helped you better understand the research going on in disciplines other than your own?

- Yes
- No
- Comments:

Do you feel the workshop made adequate progress toward finding a common language across disciplines for research on the workshop's topic?

- Yes
- No
- Comments:

Do you feel that the exchange of ideas that took place during the workshop will influence your future research?

- Yes
- No

Comments:

Did you develop unanticipated plans for collaborative research with other workshop participants?

Yes

No

Comments:

What do you feel was the most useful aspect of the workshop?

What would you have changed about the workshop?

How do you feel about the format of the workshop?

This was a very effective format for achieving our goals

This was not a very effective format for achieving our goals ->

The workshop format would have been more effective if:

Please indicate your level of satisfaction with the workshop accommodations:
(Very satisfied, Satisfied, Neutral, Dissatisfied, Very dissatisfied, Not applicable)

Travel arranged by NIMBioS

Housing arranged by NIMBioS

Comfort of the facility in which the workshop took place

Resources of the facility in which the workshop took place

Please indicate any changes NIMBioS can make to improve the resources and/or accommodations available to workshop participants:

How satisfied were you with the opportunities provided during workshop presentations and discussions to ask questions and/or make comments?

Very satisfied

Satisfied

Neutral

Dissatisfied

Very Dissatisfied

Please indicate any suggestions you have for facilitating communication among participants during the workshop:

Please use this space for additional comments: