

## November 12, 2025 Theory Working Group Call

Attendees: Lenny Smith, Cole Brookson, Caleb Robbins, Marcus Lapeyrolerie, Bilgecan Sen, Andrew Allyn

Regrets: Freya Olsson, Abby Lewis, Ruby Krasnow

Agenda:

1. [EFI2026 Conference](#) in Toronto on August 4-7. Working groups and workshops will take place on August 4. More details to come.
  - a. Proposals for Workshop & Working Groups are now open until January 23
  - b. **Working Groups** provide extended time (1/2 day or full day) to work on specific projects with others in the EFI community. These sessions, open to all conference participants, will take place on August 4. Working Groups can be related to the standing EFI Working Groups, other projects, or targeted topics of discussion of interest to the EFI community that will benefit from dedicated in-person time at the conference.  
Submit working group ideas to: <https://bit.ly/efi2026-workinggroups>
  - c. **Workshops** are an opportunity to provide topical training, tutorials, and demonstrations for the EFI community. Workshops are approximately 1-2 hours in length and will be interspersed in the schedule on August 5-7.  
**Submit workshop ideas to: <https://bit.ly/efi2026-workshops>**
  
2. Predictability of Nature synthesis - discuss challenges and opportunities in predictability.
  - a. Bilgecan will share updates to figures and tables; Think of each figure as a section of the paper; Theory group meeting 11/12/25
  - b. Bilgecan selected 6 papers on realized predictability and 6 on intrinsic predictability from the [table of all the papers](#) compiled so far.
  - c. Fig 1- define predictability and explain the drivers. Sets up the paper and what has been considered in predictability so far
    - i. A) New addition - added numbers to walk reader through the process
    - ii. Goal - synthesis paper noting that intrinsic and realized predictability has been considered throughout history of predictability
    - iii. B) shows patterns in horizon, novelty, and scale as seen in the papers selected to highlight. There can be other patterns, but the ones shown reflect the papers
  - d. Tables 1-2: 6 papers in each
    - i. We can remove or add papers, but the ones that Bilgecan picked showed that there is good amount of work in different systems with different drivers are available
      1. Use this to showcase the diversity. It is not to do an exhaustive review
  - e. Fig 2 - define a workflow for forecasting development and hypothesis testing

- i. Now that Fig 1 is updated and have the table of papers, do not think this we want the figure highlighting figures from selected papers (this would also require extra steps to get approvals for publishing)
      - ii. So simplified to match the format of Fig 1 with numbering to explain what is going on.
      - iii. Is this figure necessary? We can put all the information in the text. Is the figure helpful?
    - f. Fig 3 - identifying gaps and opportunities
      - i. Term “challenge” could be confusing. So Bilgecan is using gaps and opportunities terminology
      - ii. Changed low/high hanging fruit to a) Single PhD or postdoc project and b) Concentrated effort across multiple projects
      - iii. To complement Fig 3, add a list of questions to the paper that PhD/postdocs can pick up and run with for example for patterns of macroecological patterns of predictability
      - iv. Long-term predictability experiments - shoutout to those that are being done, but don't think there are that many being done, so want to make a call for it
    - g. Think we are at the point where we can start writing
    - h. Discussion
    - i. What are the gaps for the Tables 1 and 2? Is there anything that we would want to change in those to prep for submission?
      - i. Goal of tables - show diversity of work being done. There will be lots more papers cited than what is in the table.
      - ii. Tables are mentioning pattern, but the patterns are not necessarily tested again - the shape of the patterns in Fig 1 can be refined further
      - iii. Papers suggest a broader idea. Then Fig 3 reinforces those ideas
      - iv. Like the numbering system of Figs 1 and 2 and like that the descriptive text with the figures rather than having to look through the paper text to get it
      - v. To understand predictability, want to be able to compare across forecasts
        - 1. Talk about the importance of a standardized framework to compare predictability.
        - 2. Ask people to justify their chosen metric.
        - 3. Highlight the lack of structure for the research gap
        - 4. Here are the ways that people have tried to use for metrics
          - a. IJ Good paper from 1952
      - vi. What is the authors role in the paper to narrow the readers focus to papers that measure predictability well. How to describe what was well done and what components are not suitable for discussion
      - vii. Could add the forecast challenge structure to Fig 3 as a way to compare apples to apples
3. Reference information - papers previously discussed/shared during the 2024 calls.

- a. Discussed on 10-7-24 call. Nonlinear population dynamics -  
<https://www.nature.com/articles/s41559-019-1052-6>
  - i. See notes from the call here
- b. Discussed on 11-4-24 call. Basic principles of temporal dynamics
- c. The intrinsic predictability of ecological time series and its potential to guide forecasting; <https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecm.1359>
- d. Prediction in ecology: a first-principles framework;  
<https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/eap.1589>
- e. Fishing down the food web -  
<https://www.science.org/doi/10.1126/science.279.5352.860>
- f. Discussed on 1-14-25 call. Error metrics - the choice of error metrics can influence your overall conclusions. Ideas in this paper could feed into the synthesis and what metrics to use. Not relevant for forecasting specifically, but useful frameworks  
<https://www.sciencedirect.com/science/article/pii/S0304380023002922?via%3Dihub>
- g. EDM paper - <https://www.pnas.org/doi/pdf/10.1073/pnas.1417063112>
- h. Pennekamp paper with weighted permutation entropy:  
<https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecm.1359>
- i. Came up in the 11-4-24 call. Temporal ecology in the Anthropocene  
<https://onlinelibrary.wiley.com/doi/10.1111/ele.12353>
- j. Came up in the 11-4-24 call. Forecasting phytoplankton blooms  
<https://esajournals.onlinelibrary.wiley.com/doi/10.1002/fee.2376>
  - i. Here is the Supplemental Table with the specific example:  
<https://esajournals-onlinelibrary-wiley-com.libproxy.rpi.edu/action/downloadSupplement?doi=10.1002%2Ffee.2376&file=fee2376-sup-0003-TableS3.pdf>