



## A Message from SFI Vice President for Science



Wow. What a difference a month makes. Life has changed deeply for us all, no matter where we are in the world. But as scientists, especially for those of us whose work is mostly computer-

based, many familiar rhythms remain, albeit with a shift from in-person to online.

Although convening diverse, curious, smart people together, in person, to have novel, illuminating and profound conversations is one of SFI's key superpowers, we are quickly finding our stride in this strange new "together, apart" world. Local SFI staff and researchers have been working from home since March 13, and all of our in-person visitors, seminars, meetings and events are cancelled through August. But the world of remote seminars and discussions and meetings is providing interesting new opportunities for the SFI community and the world-wide community of researchers.

The pandemic itself, of course, shines a light on the critical importance of science. Several SFI affiliated researchers are on the front lines of SARS-CoV-2 and Covid-19 research, and many more are using diverse tools and frameworks from complexity science to shine a light on different features of pandemics and contagions. For example, SFI's first Flash Workshop (March 31), "After the First Wave," organized by SFI professors **Michael Lachmann** and **Cris Moore** and former Omidyar Fellow **Sam Scarpino** (Northeastern) featured talks by front-line epidemiological researcher **Lauren Ancel Myers** (UT Austin, SFI) and economist **Rajiv Sethi** (Columbia, SFI) along with other speakers. Over 130 people participated. A second Flash Workshop is scheduled for Tuesday, April 14, on "Incentives, Levers and Beliefs: Psychological, Social and Economic Mechanisms to Mitigate Pandemics and their Social Effects," organized by **David Krakauer**, **Michael Lachmann**, and **Cris Moore**. **Mirta Galesic** (SFI), **Eric Maskin** (Harvard, SFI), **Mahzarin Banaji** (Harvard, SFI), **Matt Jackson** (Stanford, SFI) and **John Geanakoplos** (Yale, SFI) are the featured speakers.

Another new SFI initiative launched on March 30. "Transmission: SFI Insights into Covid-19" features short

articles written by members of our extended community. The articles highlight a unique, complexity science inflected insight into Covid-19 or pandemics more generally. The series was created by our president **David Krakauer** and there are now 15 Transmissions, with five more being posted to our website each Monday. Please consider writing one or more! Eventually, they will be compiled into a volume published by the SFI Press.

You'll find information later in this Matrix and online about our remote seminars-the first five were very successful. In fact, because we now advertise these to the entire SFI community of researchers, we have far more people "showing up"-about 40 participants for each talk. We have scheduled 1-2 seminars per week through the end of May, including two Colloquia, and will continue to schedule more. Please contact me and Della Vigil Gonzales if you'd like to give one.

Most workshops and working groups are rescheduling for the late fall, winter, and beyond. A few, however, are moving online. For example, on April 23 **Mahzarin Banaji** (Harvard, SFI) will convene her long-planned working group on "Language as a Window into Human Minds: Explorations with Computer-Resident Language and Naturalistic Conversation." I am happy to consider proposals for remote or in-person science meetings, including rapidly organized, pandemic-related "Flash Workshops."

Cheers, and Be Well!

**Jennifer Dunne**  
*Vice President for Science*

## Updates and trends

The Office of Sponsored Research and Research Development is open virtually! We encourage all SFI PIs who would like to submit research grant proposals, who have questions about existing grant management, or who would just like to say 'hello' to contact **Susan Carter** at [scarter@santafe.edu](mailto:scarter@santafe.edu) or **Lori Kam** at [lkam@santafe.edu](mailto:lkam@santafe.edu). We can also arrange virtual meetings, and hope to hear from you soon.



On Friday, March 20th the Office of Management and Budget (OMB) issued the following general guidance that it recommended for agencies and institutions addressing the COVID-19 emergency: <https://www.whitehouse.gov/wp-content/uploads/2020/03/M-20-17.pdf>

This guidance is not mandatory, and various agencies have responded to different degrees in addressing some of the issues contained in the guidance. SFI anticipates that in instances where an agency does not release specific guidance for its grants, we will probably follow the directions contained in this general OMB Notice.

A good summary of the current policies and responses to the COVID-19 emergency for each federal agency can be found on the [Council on Governmental Relations](#) (COGR) website. Many agencies have extended deadlines on proposals due in March or April, and several, including [The National Science Foundation](#) (NSF) and the [National Institutes of Health](#) (NIH) have either released special requests for proposals related to COVID-19, and/or have indicated their interest in receiving proposals to address COVID-19 issues.

The Coronavirus Response Bill signed into law on March 27th includes additional funding for research at several federal agencies, including the NIH, DOD, DOE, and the NSF. [A summary of the bills' provisions related to research can be found in this Science Policy News Bulletin from the American Institute of Physics \(AIP\).](#)

## Funding and people

### Recent Proposals

**Melanie Mitchell**, NSF *AI Institute: Planning: Foundations of Intelligence in Natural and Artificial Systems*. \$499,918 over two years.

**Henrik Olsson and Mirta Galesic**. NSF *MMS Novel Wisdom-of-Crowds Approaches to Improving Predictions of Election Polls*. \$388,372 over two years.

**Henrik Olsson and Mirta Galesic**. NSF *AccelNet: Adaptation to Uncertainty in Changing Social Systems*. \$537,517 over three years.

**Sid Redner and Vicky Yang**, NSF *Collaborative Research: GCR: Unifying Regulatory Scaling in Biological, Social, and Mechanical Systems*. \$1,800,713 over five years.

**Hajime Shimao and David Wolpert**, NSF *Collaborative Research: A Computational Model for Organizational Analysis and Theory*. \$327,901 over two years.

**Jennifer Dunne, Geoffrey West and Chris Kempes**. ASU / NSF *BII Implementation: Failure and Regeneration in Complex Biological Systems at Scale*. \$1,213,272 over five years.

**David Kinney, Simon DeDeo, and Carrie Cowan**. NEH *Foundations and Applications of Cultural Analytics in the Humanities*. \$247,932 over three years.

**Melanie Mitchell**, *Artificial Intelligence Journal Proposed Workshop: Concepts, Abstraction, and Analogy in Natural and Artificial Intelligence*. €17,000 for one year.

### Recent Awards

**Mirta Galesic and Henrik Olsson**, NSF *Influence of Peers on Beliefs about Vaccination and GM Foods: Mechanisms and Interventions*. \$343,714 over two years.

**Aaron Clauset**, NSF *Workshop: A New Synthesis for the Science of Science*. \$40,418 for one year.

**Sid Redner**, NSF *First-Passage and Non-Equilibrium Dynamics of Many-Body Systems*. \$385,377 over three years.

## EXTERNAL FACULTY PROFILE

**Sean Carroll**, Research Professor of Physics at [Caltech](#).



### 1) How did you first get involved with SFI?

I have been an admirer of SFI since my time in graduate school—I still have a well-thumbed copy of “Complexity, Entropy, and the Physics of Information” from 1990. But it wasn’t until the past couple of years that I started visiting regularly, following invitations to workshops on the thermodynamics of computation organized by **David Wolpert** and others.

### 2) What does SFI mean to you?

I find interacting with SFI and its researchers to be an exhilarating experience. There is both a strong substantive overlap in research, given my ongoing interests in entropy and the arrow of time, as well as a commonality of spirit. SFI is blessedly open to imaginative interdisciplinary ideas in a way that many physics departments are not.

### 3) How have you been involved with SFI recently? What are you working on now?

I have been part of the advisory committee for the Complex Time program, as well as a participant in several public events, including the Interplanetary Festival. I’m looking forward to my first extended research visit for a couple of weeks this summer. And I’ve been lucky enough to feature a number of SFI researchers on my podcast, *Mindscape*—**Geoffrey West**, **Melanie Mitchell**, **Daniel Dennett**, **Suresh Naidu**, and others.

### 4) What are you working on now?

My research time is divided between two areas. One is the foundations of quantum mechanics, especially the Many-Worlds theory and how it relates to the emergence of spacetime and quantum gravity. The other is the arrow

of time, where I am currently working on how causal order arises from increasing entropy.

## Opportunities

Please contact **Susan Carter**, SFI Research Development Director, at [scarter@santafe.edu](mailto:scarter@santafe.edu) for more information or assistance with these opportunities.



### FEDERAL AGENCIES

#### National Science Foundation (NSF)

##### [NSF Dimensions of Biodiversity 2020 \(NSF 20-524\)](#)

The goal of the Dimensions of Biodiversity campaign is to transform how we describe and understand the scope and role of life on Earth. It takes a broad view of biodiversity, and focuses on the intersection of genetic, phylogenetic, and functional dimensions of biodiversity. Successful proposals must integrate these three dimensions to understand interactions among them. While this focus complements several core programs in the Biological Sciences Directorate at NSF, it differs by requiring that multiple dimensions of biodiversity be addressed simultaneously, in novel ways, to understand their synergistic roles in critical ecological and evolutionary processes, especially pertaining to the mechanisms driving the origin, maintenance, and functional roles of biodiversity.

The 2020 Dimensions of Biodiversity program is restricted to projects supported by international partnerships with the National Natural Science Foundation of China (NSFC), the São Paulo Research Foundation (FAPESP) of Brazil, and the National Research Foundation (NRF) of South Africa. Proposals are to be submitted jointly, with the US PIs submitting to NSF and the collaborating Chinese, Brazilian, or South African PIs submitting to their appropriate national funding agencies. **Full proposal deadline: April 20, 2020**

##### [Human Environment and Geographical Sciences Program \(HEGS\); NSF 20-547](#)

The objective of the Human-Environment and Geographical Sciences (HEGS) Program is to support basic scientific research about the nature, causes, and/or consequences of the spatial distribution of human activity and/or environmental processes across a range of scales. Projects about a broad range of topics may be appropriate for support if they enhance fundamental geographical knowledge, concepts, theories, methods, and their application to societal problems and concerns. On occasion HEGS will support Research Coordination Networks (RCNs). However, RCN proposals must convincingly demonstrate that the RCN is exploring a new, significant research direction, and that the RCN will constitute a new network of scientists

and collaborations. *A proposal to the HEGS Program must explain how the research will contribute to geographic and spatial scientific theory and/or methods development, and how the results are generalizable beyond the case study.*

A PI or Co-PI may be listed on only one proposal per cycle. **Full Proposal Deadlines: August 18, 2020 and January 19, 2021.**

##### [Enabling Discover through GENomic Tools \(EDGE\) \(NSF 20-532\)](#)

The Enabling Discovery through GENomic Tools (EDGE) program supports genomic research in two tracks that address the mechanistic basis of complex traits in diverse organisms within the context (environmental, developmental, social, and/or genomic) in which they function. The EDGE program also supports the development of innovative tools, technologies, resources, and infrastructure that advance biological research focused on the identification of the causal mechanisms connecting genes and phenotypes. **EDGE is designed to provide support in two tracks (Note: these tracks have changed): (1) Functional Genomic Tools:** for proposals aimed at developing tools for gene manipulation and/or phenotyping, analytical approaches or infrastructure to overcome one or more blocks to direct tests of gene function on demand; this track combines the comprehensive and targeted tracks from the previous EDGE solicitation;; and **(2) Complex Multigenic Traits:** for proposals focused on hypothesis driven research to understand causal mechanisms connecting genomes and complex multigenic organismal phenomes across a variety of environmental, developmental, social, and/or genomic contexts. **Deadlines: Full proposals accepted anytime.**

##### **Foundations (Division of Mathematical Sciences)**

The program in Foundations supports research in mathematical logic and the foundations of mathematics, including proof theory, recursion theory, model theory, set theory, and infinitary combinatorics. **Deadline: Target Date: September 22, 2020.**

##### [Dynamics of Integrated Socio-Environmental Systems \(CNH2\) \(NSF 19-528\)](#)

The CNH2 program acknowledges a continuum of environments from those with very limited human impacts (e.g. the extreme poles) to those in which human systems and processes fully dominate (e.g. densely populated megacities). There are integrated systems operating in all these spaces, and many can be considered as domains for CNH2 study. For the purposes of this solicitation, we define the “socio” or human component of the system as one predominantly governed by human decisions, actions, and behaviors, and we define the “environmental” component of the system as one predominantly governed by biological, physical, and chemical processes. CNH2 projects can include research that investigates integrated socio-environmental systems in agricultural as well as in urban settings.



**Deadline: LOI: September 17, 2020; Full proposal November 16, 2020.**

[Dear Colleague Letter: Research Collaboration Opportunity in Europe for NSF Awardees INSF 20-069\)](#)

This letter invites current NSF grantees to submit supplemental funding requests for research visits to any identified, appropriate ERC-funded European research group. NSF particularly encourages requests from NSF grantees who are early on in their careers or who are still actively building their careers. Further, the letter gives instructions on how to submit supplemental funding requests and other relevant policies and requirements.

ERCEA has provided a list of ERC-funded principal investigators (PIs) and research teams interested in hosting NSF grantees. NSF grantees should request this list via email from Roxanne Nikolaus, Program Director, Office of International Science and Engineering, at [rnikolau@nsf.gov](mailto:rnikolau@nsf.gov), and then communicate directly with ERC PIs to ascertain areas of mutual interest and research goals for a visit. This opportunity is open only to PIs and co-PIs of active NSF awards.

**Deadline: Supplemental Funding Requests must be received at NSF at least 3 months prior to the proposed visit, but no later than May 15, 2020, for consideration using Fiscal Year 2020 funds.**

#### NASA

##### [ROSES 2020](#)

NASA has released Roses 2020 with a list of its research opportunities in space and earth science. There are a multitude of opportunities in astrophysics data analysis, biodiversity, exobiology, planetary science, citizen science for earth systems, topical workshops and symposia, and more.

**Deadlines: Deadlines vary by Program. Some program deadlines have not yet been announced. For those that have been announced, deadlines for Notices of Intent range from late March through fall and early winter 2020; Full proposal deadlines vary from May 19, 2020 through January 2021.**

#### FOUNDATIONS

##### [Simons Foundation Targeted Grants in MPS](#)

The program is intended to support high-risk theoretical mathematics, physics and computer science projects of exceptional promise and scientific importance on a case-by-case basis.

**Deadline: The deadline is rolling and an LOI can be submitted at any time.**



## Looking Ahead

### EVENTS

[Workshops/Working Groups, Colloquia, Seminars, and more](#)

#### Online Science Talks & Discussions

3/18/20 Seminar “Conceptual Abstraction and Analogy in Natural and Artificial Intelligence,” **Melanie Mitchell** (Portland State University; SFI)

3/24/20, Discussion “SFI A New Hope: A New Series-Transmission,” **David Krakauer** (SFI)

3/25/20 Seminar “Examining Complex Socio-Ecological Systems in Australia,” **Stefani Crabtree** (Utah State University; SFI)

3/26/20 Seminar “Explosive Proofs of Mathematical Truths,” **Simon DeDeo** (Carnegie Mellon University; SFI)

4/1/20 Seminar “Phylogenetics and genealogy-valued Markov processes,” **Aaron King** (University of Michigan)

4/8/20 Slice of Science Seminar “How to detect life as we don’t know it,” **Natalie Grefenstette** (SFI)

4/15/20 Slice of Science Seminar “Transparency in algorithms for risk assessment, housing, and pretrial detention,” **Cris Moore** (SFI)

5/6/20 Colloquium “Scientific Machine Learning: Where physics-based modeling meets data-driven learning,” **Karen Willcox** (University of Texas, Austin; SFI)

5/20/20 Colloquium “Data Privacy and Dignitary Privacy: Google Spain, the right to be forgotten, and the construction of the public sphere,” **Robert Post** (Yale University)

#### Online Science Meetings

3/31/20 Flash Workshop “After the First Wave,” organized by **Michael Lachmann**, **Cris Moore** (SFI), **Sam Scarpino** (Northeastern)

With speakers:

**Lauren Ancel Meyers**, University of Texas, Austin; SFI

**Sara Del Valle**, Los Alamos National Laboratory

**Caroline Buckee**, Harvard University

**Rajiv Sethi**, Columbia University; SFI

**Glen Weyl**, Microsoft and RadicalxChange Foundation

A video of the event is available [here](#) on SFI’s YouTube channel

4/14/20 Flash Workshop “Incentives, Levers and Beliefs: Psychological, Social, and Economic Mechanisms to Mitigate Pandemics and their Social Effects,” organized by **David Krakauer, Michael Lachmann, Cris Moore** (SFI).

With Speakers:

**Mirta Galesic**, SFI

**Eric Maskin**, Harvard University; SFI

**Mahzarin Banaji**, Harvard University; SFI

**Matt Jackson**, Stanford University; SFI

**John Geanakoplos**, Yale University; SFI

4/23/20 Working Group “Language as a Window Into Human Minds: Explorations with Computer-Resident Language and Naturalistic Conversation,” organized by **Mahzarin Banaji** (Harvard, SFI)

Other meetings through August are being conducted online or rescheduled.