



July / August 2012

# UPDATE

## SFI-Templeton meeting asks why complexity pervades nature, civilization

From the rise of complex human institutions such as cities and nation states, to the evolution of intelligence in natural systems, complexity is a pervasive feature of our universe, our society, and our biological selves.

Why should that be, and how can we study complexity, understand it, even predict its future forms across systems and scales?

A three-day SFI meeting in early August, "Complexity: Life, Scale, and Civilization," convenes some of the biggest thinkers in science to grapple with some of the biggest questions in science.

"From the Big Bang to the Mayans, from the gene to the global economy, why is there complexity in the universe?" asks SFI External Professor David Krakauer. "This is about the biggest questions you would ever want answered. Why are we here? What is the fate of our species? What is the fate of our planet?"

The event is the first in a series of gatherings that are part of a John Templeton Foundation ([www.templeton.org](http://www.templeton.org)) grant to SFI. The three-year, \$5 million grant funds three SFI research projects that together seek deeper quantitative understanding of the nature of complexity in the social and biological worlds:

- The evolution of complexity and intelligence on earth, led by David Krakauer
- The hidden laws that pervade complex phenomena, especially biological and social phenomena, led by SFI Distinguished Professor Geoffrey West
- Universal patterns in the emergence of complex societies, led by SFI President Jerry Sabloff

The grant also supports the creation of an online education resource, the Complexity > [more on page 2](#)



### RESEARCH NEWS

## Heading off drug resistance in fast-evolving pathogens

By identifying those relatively few biochemical reactions most essential to all life-sustaining metabolic processes, research led by SFI External Professor Andreas Wagner may help drug makers prevent pathogens from evolving biochemical workarounds to the processes traditional antibiotics are designed to disrupt.

Drug-resistant pathogens are among the most dangerous threats to public health today. Previous research in the field has focused on identifying chemical reactions essential for specific pathogens to live, and then developing drugs to inhibit those reactions essential to the pathogen but not needed by people.

"But a reaction essential in one pathogen may not even exist in another," says Andreas, "or there may be an alternative pathway of chemical reactions that can produce the products the pathogen needs."

When such an alternative pathway exists, pathogens under selection pressure from antibiotic use may quickly develop drug resistance by gaining the genetic machinery from another organism (through a process called horizontal gene transfer) for that alternative pathway.

The new research identifies a short list of reactions essential to all metabolic processes that cannot be bypassed. Those reactions Andreas calls "superessential," and his team's research finds 125 of them.

To identify them, the researchers constructed a "universal metabolic network" from 5,906 metabolic reactions known to take place in organisms. Because this universal network would contain all possible alternative pathways that could bypass a reaction, the team was able to identify an irreducible set of reactions essential for metabolism, then generate a ranking based on how essential each reaction is.

The team cross-checked the results by identifying essential reactions in randomly generated combinations of processes that form fictional, but theoretically viable, metabolic networks for given environmental conditions.

By targeting those reactions that rank highest, the researchers believe, drug developers can head off the evolutionary processes that lead to drug resistance.

The results the team reported in the May 1 issue of *PNAS* are limited to reactions that are superessential for the biological use of carbon sources, such as the sugar glucose. Now the team is turning its sights on reactions involving nitrogen and sulfur sources – two more of the six total elements required for life.

The additional results are forthcoming, says Andreas, "but the day only has 24 hours." ■



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### RESEARCH NEWS

## Theme week seeks to synthesize info and game theory

Information theory and game theory have been "almost like two different civilizations that were born simultaneously but, because of where they were going, had little to say to one another," according to SFI External Professor David Wolpert.

Today, synthesizing the two fields is likely to "yield lots of low hanging fruit, where you can just take the results of one field, apply them to problems in the other field, and make some progress," he says.

Such a synthesis is the goal of a workshop at SFI August 13-17, jointly hosted by SFI and the Center for Nonlinear Studies (CNLS) at Los Alamos National Laboratory.

> [more on page 3](#)

### RESEARCH NEWS

## How we can better understand financial crises

American writer and political commentator Walter Lippmann once said: "Where all think alike, no one is thinking."

During a three-day symposium in May dubbed the economics "rethink," researchers from SFI and the Krasnow Institute for Advanced Study gathered with course participants at the George Mason University campus in Arlington, Virginia, to examine the global financial crisis and its continuing effects – and ask how financial markets and global economies might be better understood, analyzed, and predicted through the sciences of complexity than through traditional economic theory.

> [more on page 4](#)



In a June 11 interview in *GQ*, actor-playwright-director Sam Shepard discusses his love of writing and the time he spends at the Institute, noting “there’s all kinds of people here. There’s physicists, there’s archaeologists, there’s biologists. The process that they’re going through of investigation is very, very similar to art in an odd way, or to writing. So there’s a lot of dialogue formulated around that idea.”

A June 5 *New York Times* article about the hidden currents underlying collective social behavior notes the work of SFI External Professor Doyne Farmer in developing agent-based models of the U.S. economy. In the article, Doyne says “classical economics had failed miserably to provide the right data for us to understand ourselves.”

*The New York Times* and *Wired* covered a paper published June 6 in *Nature* in which an international team of scientists – including SFI External Professors Jim Brown, Pablo Marquet, and John Harte – examines the evidence for a possible state shift in the Earth’s biosphere. The authors warn that this evidence suggests that population growth, destruction of ecosystems, and climate change may be driving Earth toward sudden, irreversible, and destructive changes.

Newborn babies are the only people capable of intuitively understanding quantum mechanics, in which particles are neither here nor there, but both places at once (and everywhere in between), according to SFI External Professor Seth Lloyd, who spoke as part of a panel discussion at the World

Science Festival in New York. MSNBC.com on June 6 notes Seth’s remark that the first time a child plays the game peekaboo may be when that innate intuition is lost, as the object behind the hands (mom or dad) is confirmed to be “there” – in a single place – time and time again.

A June 4 article in *Discover Magazine* features SFI Omidyar Fellow Anne Kandler’s project to model the cultural influences on endangered languages, using Scottish Gaelic as a case study.

A May 29 article in *The Atlantic* about the higher cost of living and greater economic vitality of “walkable cities” cites SFI’s cities and urbanization research, noting that SFI Distinguished Professor Geoffrey West

“once observed that urbanists have none of the kind of underlying principles that can be tested and proven like scientists do.”

Airports are inextricably connected to the faster pace of urban metabolism, according to a May 25 article in *The Atlantic* that cites SFI’s cities and urbanization research.

Phys.org reports that after decades of silence and in response to a recent paper by two researchers who attempted to recreate his feat, SFI External Professor Doyne Farmer last month revealed in the journal *Chaos* how he, as a graduate student in the 1970s, beat the odds at roulette using physics and a small wearable computer.

## Nonlinearities

From the editor

Notice anything different? After 34 consecutive issues of the SFI *Update* in the color orange, this issue is, of course, green. You might notice other, more subtle differences in the design of this and other SFI publications. It’s part of a “refresh” of SFI’s visual identity, something we do every so often. I hope you like the new look and the less predictable color theme for every issue. (Why did we use orange for so long, you ask? Our previous visual playbook prescribed orange for the *Update*. I, for one, am glad to loosen the reins a bit.)

In this economic climate, it takes a whole lot of hard work to raise the private financial support that allows the Institute’s science to keep happening. Fortunately, SFI VP for Development Nancy Deutsch and her team always find new ways to encourage members of our community – that’s you – to support SFI. Her current campaign is about legacy giving – which is to say there are lots of ways to arrange your estate such that you and SFI can benefit, both today and when you aren’t around to enjoy your wealth any longer. Even better, a legacy gift might reduce your current tax burden. Check out the SFI website, or pick up a copy of the new “Five Ways” brochure the next time you’re at SFI.

**A very special correction**  
I goofed spectacularly in the last issue. Under a page 3 photo, the offending caption read: “John Miller (right of center) and REU students conduct an impromptu experiment in SFI’s kitchen.” It’s quite true that John Miller is there, and that he is right of center. And there is some kind of experiment going on (John claims “tepid fusion”). And it is happening in SFI’s kitchen. But none of the people in the photo are, in fact, REU students. On the left, that’s then-SFI Professor Eric Smith. Next to him is Chris Kempes, a PhD candidate at MIT. And on the right is Sanjay Jain, a professor at the University of Delhi. Ouch! My sincere apologies to actual REU students. Seriously guys. Thanks for your graciousness. ■

– John German, [jdg@santafe.edu](mailto:jdg@santafe.edu)



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## RESEARCH NEWS

### New ways to understand how the genome is organized, and why

By comparing data about genome sizes of more than 1,000 genomes from the three extant domains of life, a team of researchers has quantified regularities and global genomic differences across domains, finding mathematical relationships that link prokaryotes (one-celled bacteria and archaea) with eukaryotes (one- and many-celled organisms containing nuclear DNA).

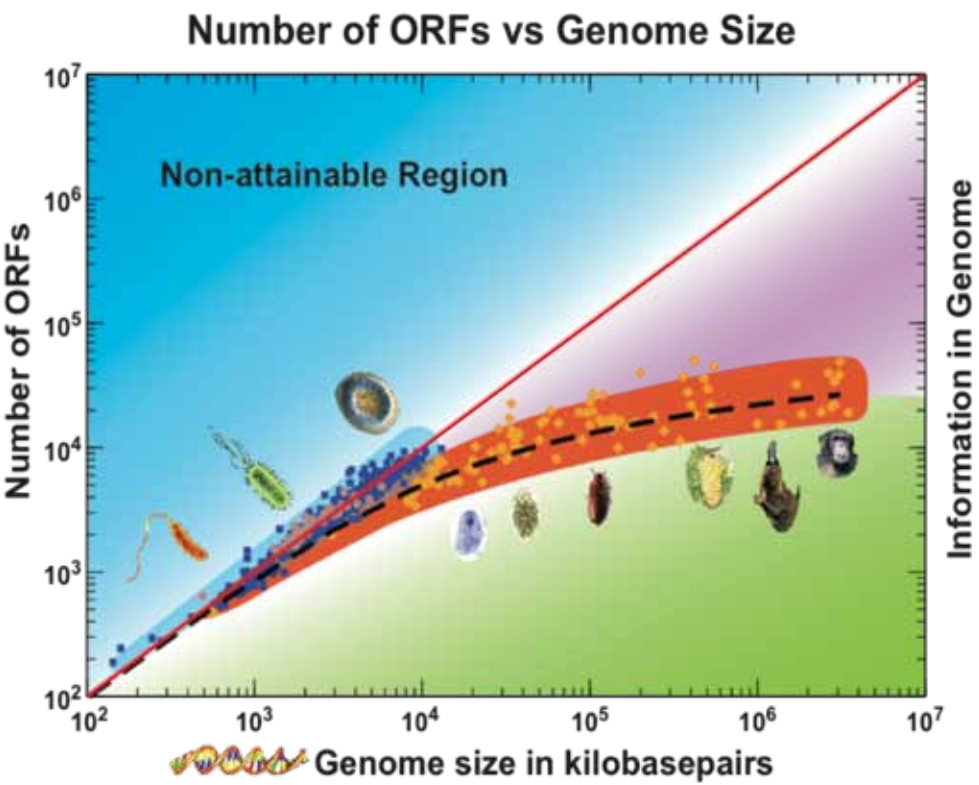
The study offers fresh insights on several fronts that will impact ecology, genome sequencing, medicine, genetics, evolution, and synthetic biology, says Juan Perez-Mercader of Harvard, an SFI External Professor and a study co-author. The results:

- Shed new light on the way DNA is organized in a genome and how this organization is linked to the generic use of information by all living systems.

- Suggest an essential difference between the way information is handled by prokaryotes and eukaryotes and why prokaryotes cannot be larger than a particular size.
- Help clarify the reasons for the existence of so-called “junk DNA,” the largest portion of our genomes.
- Shed new light on one of the most dramatic transitions in the evolution of life: the emergence of eukaryotes about 2 billion years ago.

The authors’ interpretation is based both on the properties of the Benford distribution (a mathematical relationship that is known to fit a wide variety of data) and on the properties of information as a physical quantity.

Read more about the study, published in the May 18 issue of *PLoS One*, at [www.santafe.edu/news](http://www.santafe.edu/news). ■



Logarithm of the number of ORFs (Open Reading Frames) versus the logarithm of genome size (measured in thousands of DNA base pairs). Prokaryotes, including bacteria (in blue) and archaea (in magenta), lie along the straight red line. Eukaryotes (in orange) display a very different nonlinear behavior for large genomes (as indicated by the dashed black line), but merge smoothly with the prokaryotes for small genomes. Prokaryotes hug the diagonal red line because their genomes are composed almost entirely of coding DNA (with only a small percentage of non-coding DNA). Another feature of the prokaryotes is that the data end abruptly, perhaps indicating a maximum genome size for them. (Image: Sharon Mikkelsen, Los Alamos National Laboratory)

#### > *SFI-Templeton meeting* continued from page 1

Explorer, that will offer materials for both educators and learners in the sciences of complexity.

On the evening of Monday, August 6, the event gets underway with a panel discussion on the nature of complexity moderated by David. The discussion, 7:30-9:00 p.m. at the James A. Little Theater, is open to the public and features an open mic Q&A following remarks from the panelists. Speakers include Lord Colin Renfrew, Sir Christopher Llewellyn

Smith, SFI External Professor Melanie Mitchell, and SFI Distinguished Fellow and Nobel laureate Murray Gell-Mann.

The event continues Tuesday and Wednesday with an invitation-only science meeting featuring sessions on SFI’s Templeton Projects.

More about the meeting and the John Templeton Foundation-funded projects is available at [www.santafe.edu/](http://www.santafe.edu/). ■

## RESEARCH NEWS

### New Ronin Institute seeks to reinvent the academic career

Jon Wilkins says it’s time for society to find a way for talented scientists to conduct research outside the constraints of the university setting.



Ronin is a term used to describe a samurai warrior (seen here) with no lord or master during the feudal period (1185–1868) of Japan – for Jon Wilkins a fitting metaphor for a highly skilled but masterless scientist.

His new Ronin Institute ([www.ronininstitute.org](http://www.ronininstitute.org)) provides accomplished scientists many of the needed elements of scientific discovery – an institutional affiliation, interactions among colleagues in different disciplines, and help with grants research, applications, and reporting – but without the bureaucratic burdens of academia.

“That’s the SFI vision and part of the reason I went to SFI originally instead of taking a job at a university,” says Jon, a former SFI Professor who recently left New Mexico. He remains an SFI External Professor.

The Ronin Institute’s design shares much with SFI’s, but relies on communications technology rather than a physical space to provide research support and create fruitful interactions among scientists.

Like SFI, Ronin attracts researchers who want to explore questions that cross academic disciplines. Jon hopes to provide a place for talented people to continue their research while they are looking for a university appointment, or for those whose family commitments make a full-time research appointment untenable.

As an evolutionary biologist, Jon says he needs little more than a laptop to conduct his own research. This is true of many researchers, especially in the social sciences, he says.

“I can work from home or Starbucks,” he says. “I pick up my kid from school every day and it’s a much nicer way to live. There are tens of thousands of people out there who are in that position. The majority would love to be involved in research, and as a society we need to figure out a way to make that happen.” ■



On May 1 *New Scientist* notes that by analyzing how authors use certain words, SFI External Professors Dan Rockmore and David Krakauer and colleagues showed in a recent *PNAS* paper that writers' styles are more like their contemporaries than the great masters of the past.

In *The Telegraph* (U.K.) on April 13, actor, playwright, director, and SFI Miller Scholar Sam Shepard talks about life, making movies, and the cross-disciplinary interaction at SFI. A June 7 interview on CNN.com notes his affiliation with the Institute and his work with SFI's Valerie Plame Wilson, a former CIA operative who helped him prepare for his role as an assistant CIA director in the movie "Safe House."



**Video: SFI External Professor and Science Board member Tim Kohler** offers lessons from 20 years of archaeological research informed by complex adaptive system science. Source: SFI Science Board Symposium talk



**Video: SFI External Professor and Science Board member Seth Lloyd** discusses the growing field of quantum biology. Source: World Science Festival panel



**Audio: SFI Miller Scholar Rebecca Goldstein** discusses philosophy, empiricism, and mathematics...and

what it means to be human. Source: Santa Fe Radio Café interview



**Video: Author James Gleick** explores some ways information technologies have changed the nature of human consciousness. Source: SFI 2012 Community Lecture



**Video: SFI President Jerry Sabloff and Faculty Chair Doug Erwin** explore future directions for SFI science. Source: SFI Science Board Symposium talk



**Video: SFI External Professor Lauren Ancel Meyers** describes

new quantitative tools for tracking and curbing the next pandemic. Source: SFI Science Board Symposium talk



**Video: Damon Centola and Marcele Selathe** describe new social network approaches and analysis methods for improving human health. Source: SFI Science Board Symposium talks



**Video: SFI Distinguished Fellow Murray Gell-Mann** offers his thoughts on the movie "Groundhog Day." Source: SFI-CCA 2012 Science On Screen Series

## RESEARCH NEWS

# Animal body sizes, feeding rates linked to food search space

A UCLA research team, including SFI External Professor Van Savage, has demonstrated that the relationship between animal body size and feeding rates is largely determined by the properties of the space in which they search for their food.

The work was published May 30 in *Nature*.

Most previous work on food webs and predator-prey relationships has assumed that feeding rate increases with body size independent of dimensionality, Van says.

The UCLA team found that an animal searching for food in a three-dimensional space, such as the ocean or sky, is likely to consume much more than a similarly sized animal searching in a flat, two-dimensional space, such as a savannah or a sea bed.

"In nature, the third dimension usually adds a huge number of extra resources," he says. "Ultimately, searching in this extra dimension provides many more chances to find food."

As part of the study, the researchers developed a mathematical model that predicted



that feeding rates increase more quickly with body size in three dimensions than in two. To test their predictions, they compiled and analyzed the largest-ever database on relationships between feeding rates and body size.

They were surprised to discover how well the data fit their predictions.

The study also predicts that the stronger feeding interactions in three dimensions – that is, the tendency for animals to consume more than they would in two dimensions – will lead more often to boom-and-bust cycles in the abundance of species. These fluctuations make species more prone to extinction and therefore could have consequences for biodiversity, Van says.

The researchers also are looking at the effects of temperature – another major driver of feeding rates – and studying how to combine those with the results of the study on feeding rates and dimensionality.

The ultimate goal, Van says, is predicting how climate change will affect biodiversity levels and, thus for humans, the availability of goods and services.

Two co-authors on the paper, Samraat Pawar and Tony Dell, are past participants in SFI's Complex Systems Summer School. ■

## > Info theory meets game theory continued from page 1

Called a "Theme Week," the five-day gathering revives a long-form meeting format at SFI in which more participants spend more time thinking about, talking about, and forging new collaborations around a single, broad, more permanent SFI topic than during a typical SFI workshop and working group. Reviving the Theme Week is an objective of Doug Erwin, SFI Chair of the Faculty, who hopes to organize future theme weeks on such broad topics as resilience in complex systems.

As the August workshop's organizer, David hopes to achieve progress, either in integrating the two fields or in establishing that they are incompatible. "There's no good technical case anybody has made that they

are incompatible, at least so far," he says.

To encourage cross talk, the organizing and program committees planned only a few formal presentations, sent out an open call for submissions, and will devote most of the time for participants to forge collaborations and discuss future projects.

By actively encouraging early-career researchers, postdocs, and graduate students to attend, David says the committees would like to identify new researchers interested in the two fields and in what may be done to combine them.

Some 35 participants are expected, including two Nobel laureates and numerous leading thinkers from both fields. Potential topics

include how a single agent behaves in multiple-agent scenarios, how joint behaviors can be quantified and how they vary with respect to agent preferences, how information sets available to separate agents influence decision making, how agent behaviors, strategies, and information structure interact, and whether the mathematical formalisms of the two fields can be reconciled or improve one another.

More generally, David says, greater understanding of the relation between information theory and game theory may generate breakthroughs in many disciplines, including economics, political science, the cognitive sciences, and artificial intelligence. ■



## SFI names new advisory board, faculty members

SFI made several appointments to its advisory boards and faculty during the Institute's annual Science Board and Trustee meetings in May. Profiles of each appointee are available at [www.santafe.edu](http://www.santafe.edu). Terms began July 1, 2012.

### External Professors

Eight scientists were appointed to SFI's external faculty.

**Aaron Clauset**, assistant professor, computer science, University of Colorado-Boulder

**Michelle Girvan**, assistant professor, physics, University of Maryland

**Michael Hochberg**, distinguished research director, Institut des Sciences de l'Evolution, Université de Montpellier II

**Manfred Laubichler**, President's Professor, School of Life Sciences and Center for Biology and Society, Arizona State University

**Mark Lipsitch**, director, Center for Communicable Disease Dynamics, Harvard School of Public Health

**Melanie Moses**, assistant professor, computer science and biology, University of New Mexico

**Peter Peregrine**, professor, anthropology, Lawrence University

**Jessika Trancik**, assistant professor, engineering systems, Massachusetts Institute of Technology

### Board of Trustees

Two people have been elected to the Institute's Board of Trustees.

**John Hagel III**, director and co-chairman, Deloitte Consulting LLP, Center for the Edge

**Gerry Ohrstrom**, chairman, Vistan Corporation, philanthropist

### Science Board

SFI has made two new appointments to its Science Board.

**Nazli Choucri**, professor, political science, Massachusetts Institute of Technology

**L. Mahadevan**, Lola England de Valpine Professor of Applied Mathematics, professor of organismic and evolutionary biology, and professor of physics, Harvard University ■

## ACHIEVEMENTS



The Association for Computing Machinery has selected SFI External Professor and Science Board co-chair Stephanie Forrest for the ACM/AAAI Allen Newell Award. The award recognizes her contributions to solutions in computer science and the biological sciences that provide new linkages between the fields.



The United Nations has selected SFI External Professor Sander van der Leeuw (Arizona State University) as one of six individuals to receive its 2012 Champions of the Earth award, the UN's flagship environmental honor. It recognizes outstanding visionaries and leaders for their inspiration and action for the environment.



SFI External Professor Steven Frank (UC Irvine) has been elected to the American Academy of Arts and Sciences. His work focuses on the quantitative dynamics of genetic, biochemical, and cellular mechanisms

that determine complex phenotypes, and how evolutionary processes shape the mechanisms and dynamics that give rise to phenotypes.



The National Center for Women & Information Technology (NCWIT), a coalition of some 200 universities, corporations, and organizations dedicated to increasing the meaningful participation of women in computing, has selected Irene Lee, SFI's Project GUTS principal investigator, to receive its 2012 Aspirations in Computing Educator Award.



SFI Professor Sam Bowles has been named one of TopWonk.org's "best economic thinkers" for his commitment to intellectual innovation and analytical rigor and unique ability to contribute to the public debate.



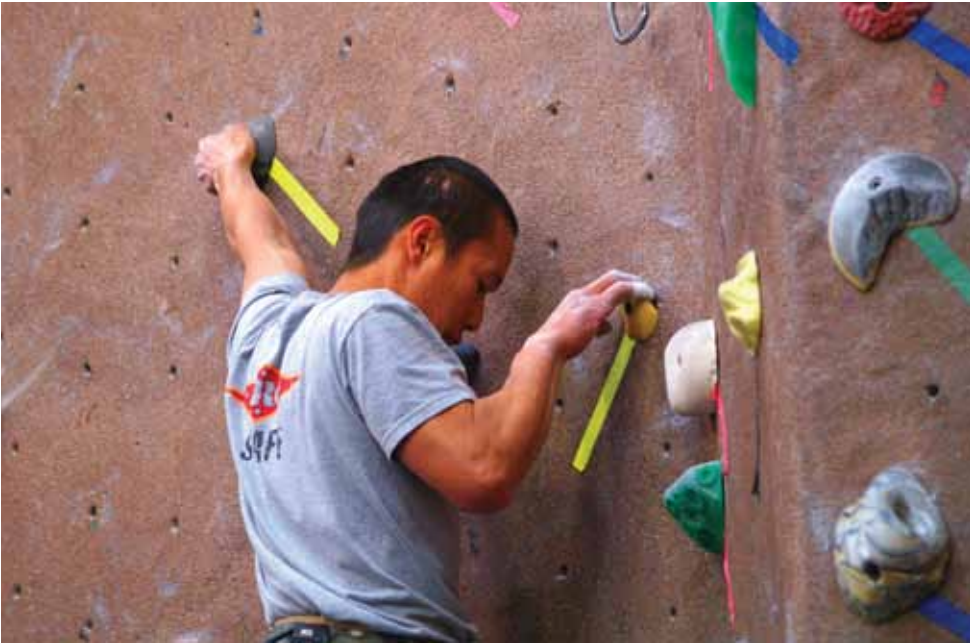
In April, SFI Distinguished Professor Geoffrey West delivered Stanford University's annual Robert Hofstadter Memorial Lectures, presented by the Stanford Physics Department, on the physics of cities. ■

## IN MEMORIAM

Elinor Ostrom, the first woman to win the Nobel Prize in Economics (2009), passed away on June 12 at the age of 78. Ostrom was a member of SFI's Science Board from 2002 to 2006. ■



# Chaos gives rock climbing a leg up



Route setter Tony Yao, a participant in Phillips’s study, tries out a movement sequence at the Boulder Rock Club.

Indoor climbing gyms offer all sorts of routes, ranging from “ladder difficulty” for novice climbers to scant trails of nubs requiring an expert’s strength, skill, and focus.

Professional route setters build these sequences of moves by securing holds of varying sizes and shapes to vertical or overhanging walls – a craft that is more art than science. New research by Caleb Phillips, a student of SFI External Professor Liz Bradley, has applied chaos theory to route setting, with surprising results.

Liz teaches a course at University of Boulder on nonlinear dynamics, where she encourages students to create projects “that can engage a community outside the ivory tower,” she says, citing previous research that applied chaos theory to choreographing dance routines and composing music. Phillips chose to use a chaos approach to mix up climbing routes.

He devised a system that can chaotically vary routes set by expert setters using a mathematical model from atmospheric convection. He then worked with a local gym to set four test routes, each of about 30 moves.

Two routes were set at each of two difficulty levels: one created entirely by a professional setter and the other based on Phillips’s algorithm. Then climbers (who weren’t aware of the experiment) climbed them all and offered their feedback in a questionnaire. The results, published in the journal *Chaos*, showed that climbers preferred the chaos-assisted routes at both difficulty levels.

“Climbing is almost an artistic expression of movement and physical difficulty – totally different from the part of the brain that deals with sequences and numbers,” says Phillips. “It’s exciting to apply skills to a different domain and see how they can work together and do something cool.” ■



# LPL Financial’s Chris Arthur: SFI has ‘a perspective our competitors just don’t have’

Interactions with other members can be as valuable to SFI Business Network representatives as the intellectual topics they tackle at Network events, according to Chris Arthur, head of portfolio strategy at LPL Financial.

“Membership increases the network of people we communicate with, and has been phenomenally valuable,” he says.

LPL, the largest network of independent financial advisors in the United States, prides

itself on its entrepreneurial spirit and on unbiased investment advice. The company joined the Business Network in January 2011 as an exploratory member.

“We had always admired the Institute for their differentiated thinking and for focusing on complex adaptive systems, and our relationship offers us a perspective our competitors just don’t have,” Arthur says. “But the most gratifying aspect of membership for us has been the engagements.” ■

# SFI awards to 13 students, one teacher

SFI has honored 13 Santa Fe-area high school seniors and one teacher with its annual High School Prize for Scientific Excellence, co-sponsored by the Santa Fe Alliance for Science.

The winning teacher for 2012 is Cynthia Salvatierra of the Santa Fe Indian School.

Winning students are Robin Bulger, Desert Academy; Monica Estrada, Capital High School; Paige Foreman, New Mexico School for the Deaf; Zachary Graybill, Monte del Sol Charter School; Philip Carter Howell, Santa Fe Secondary School; Aja Paulazzo, Santa Fe Waldorf School; Lina Saenz, The MASTERS

Program; Russell Sandlin, Academy at Larraigoite; Matthew Sullivan, Santa Fe Preparatory School; Jeff Sward, Santa Fe High School; Felicia Teba, Santa Fe Indian School; Samuel Thompson, New Mexico School for the Arts; and Miquela Wiegel, St. Michael’s High School.

The Prize was established in 1996 to honor outstanding science students, who are selected by their teachers for excellence and originality in the sciences, mathematics, or computer science. The teacher award was established in 2005 to acknowledge special achievement in advancing science education. ■

## > *Rethink* continued from page 1

The event was the most recent in SFI’s series of “short courses” designed to provide a starting point for professionals who want to learn about complex systems science and apply it to their work.

More than 60 participants from financial service companies, government regulatory agencies, and academic institutions joined with program speakers in discussions of topics ranging from nonlinear dynamics and neuroeconomics to network theory and agent-based modeling.

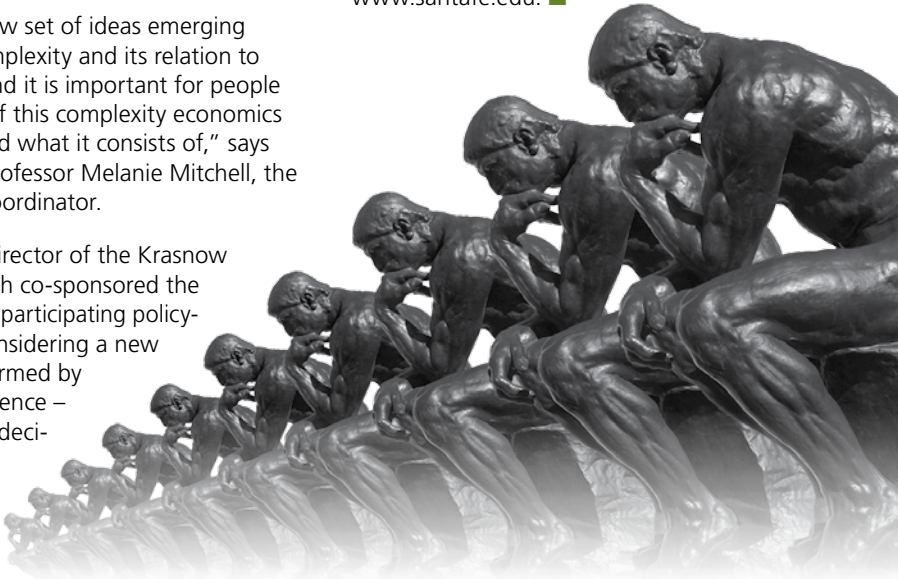
“There is a new set of ideas emerging regarding complexity and its relation to economics, and it is important for people to be aware of this complexity economics movement and what it consists of,” says SFI External Professor Melanie Mitchell, the course’s co-coordinator.

James Olds, director of the Krasnow Institute, which co-sponsored the event, praised participating policy-makers for considering a new tool set – informed by complexity science – for economic decision making

“to figure our way out of this mess” given that “the old tool set didn’t work so well.”

Participant and Investor Analytics CEO Damian Handzy thinks further exploration of complexity science will pay off. “It is the future of how economics and Wall Street are going to behave, and I want to be in on it before that future takes hold.”

The next SFI short course is September 14-16 at Stanford University; it will explore complexity in science and technology. More at [www.santafe.edu](http://www.santafe.edu). ■



## Upcoming events

**SFI Community Lecture, “The Myth of Common Sense: Why Everything that Seems Obvious Isn’t,” July 25, 7:30 p.m., James A. Little Theater.** Although common sense is useful for dealing with everyday problems, when applied to complex problems in government, business, and marketing it can suffer from systematic failures. Through examples and ideas from physics to sociology, Microsoft Research’s Duncan Watts, an SFI Omidyar Fellow alumnus, shows how we get duped by shared assumptions and demonstrates how learning to question our own common sense can lead to better solutions. This lecture is sponsored by the Peters Family Foundation. The 2012 SFI Community Lecture series is made possible by Los Alamos National Bank.

**SFI Community Lecture, “The People Decide...Sort Of,” August 15, 7:30 p.m., James A. Little Theater.** As the 2012 presidential election nears, SFI Omidyar Fellow alumnus Nathan Collins asks one of the biggest questions in politics: Can democratic societies actually make good decisions? The path to selecting the best candidate is rife with obstacles, and lobbyists and campaign finance are only part of the picture. Collins draws on science to disassemble the process, from what Americans really know about politics to the challenge of group decision making. He then speculates about who the next President of the United States will be – and whether it matters. Collins is a research director for student achievement metrics systems at Teach For America. This lecture and the 2012 SFI Community Lecture series are made possible by Los Alamos National Bank. ■

July / August 2012  
**UPDATE**

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