State of the Institute 2011: Jerry Sabloff on SFI’s budget, science, and special responsibility to complexity science

At the turn of the new year, SFI President Jerry Sabloff gave the Update his thoughts on SFI’s status and future.

Update: SFI had another tough budget year. In August you drastically cut expenditures, including salary reductions for SFI’s people, and redirected fundraising efforts. What does 2011 look like, and how is SFI adapting to what might be the new fiscal norm?

Jerry: Clearly 2010 was a tough budget year, not just for SFI but for all nonprofits. A host of issues, most notably the economy, led to many of our best philanthropic donors being more careful with their giving this year than in the past. By all accounts 2011 will be a tight year as well. We’re hopeful some of the uncertainties will pass, particularly if the economy continues to improve, but there are still a lot of ifs. We’ll have to wait and see.

We’ve gone through incredible belt-tightening, and there is no fat in our current budget. The faculty, postdocs, and staff have been terrific in examining every dollar we spend and eliminating unnecessary costs. The science is going strong. But this austerity is only a short-term tactic to get us past this difficult time. If we want to keep SFI’s character intact, our revenue base is the fundamental issue.

In particular we’re looking for new sources to fund our research. Part of our research budget comes from grants from the National Science Foundation, but we need to be broader because NSF also has tight budgets. We’re looking at the possibility of working with other government agencies, acknowledging that they too have tight budgets.

We also are looking at a much broader range of private foundations. This year, for example, we have a new grant from the Rockefeller Foundation, and we are evaluating proposals relating to complexity science for the Templeton Foundation. And, of course, our Business Network is growing with the addition of the exploratory membership [see article on page 3]. We had a great set of meetings in 2010 and that is another area where we are looking for even more interaction.

Finally, we’re looking at drastically revising our business model in some areas. Education is a good example, where Ginger Richardson is taking on the challenge I presented of finding ways education can be a break-even operation and, in the future, actually bringing in revenues. For the first time in 2011 we will be charging tuition to attend our very popular Complex Systems Summer School, but we’ll reserve funds to offer scholarships to about one-third of the students.

RESEARCH NEWS

Having trouble saving for the future? It’s only human

Saving for the future is difficult. Having a new car now always somehow seems more important than saving for a house later.

Now SFI External Professor Matthew Jackson (Stanford) and coauthor Lseat Yariv (Caltech) have shown that groups of people, from families to Congress, have the same problem, and there’s almost no way around it.

We all would rather have a car, a vacation, or an ice cream cone today rather than tomorrow.

Economists call this discounting: we discount the value of something in the future because we are impatient, which, after all, counts for something.

But things get interesting when time scales change: when you consider, say, the car in ten years versus the house in eleven years. Rational people, economists often assume, have time-consistent preferences. That is, they’ll have the same preferences no matter how far into the future the relative payoffs are.

In reality, people don’t have time-consistent preferences. People will say they want the house ten years from now, but as that decision

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RESEARCH NEWS

Market simulations in high definition

A new National Science Foundation grant is allowing SFI researchers to model financial markets in greater detail than before, potentially helping uncover factors that have seemingly eluded investors and policymakers.

The recent economic crisis revealed how poorly economists understand dynamics of the economy. In some important models, for example, corporations and banks were assumed to have acted independently and without impact, but they actually exerted influences that collectively cause patterns.

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BUSINESS NETWORK NEWS

Healthcare as a complex system

Humana Inc. and SFI’s Business Network are co-hosting a February meeting to focus on the latest developments in healthcare economics and new approaches to health and disease.

The percentage of the U.S. economy associated with healthcare is 16 percent and rising, says SFI VP for Administration Chris Wood, who manages the Business Network. Employee health and healthcare expenses have become major concerns of American businesses.

The meeting will examine the notion of health as the integrity of a complex system, improved medical intervention using social network-based models of disease spread, behavioral economics and the paradox of incentives, and agent-based modeling approaches to large-scale economic models, among other topics.

Attendees also will have an opportunity to take part in a role-playing simulation, Humana’s Health Economy Simulator, in which participants will develop a shared view of the health system and an understanding of the perspectives and interplay among key stakeholders.

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**SFI BOOK NEWS**

**Ants, networks, diversity, and culture change**

SFI and Princeton University Press recently published the first two volumes in their collaborative series "Pioneers in Complex Systems." The first, Ant Networks and Colony Behavior by SFI Science Board Member Deborah Gordon, provides an accessible look into and behavior from the complex systems perspective. The second volume, Diversity and Dynamism: How Social and Biological Systems Change by SFI External Professor Scott Page, shows how diversity makes fundamental contributions to system performance in complex adaptive systems. The series is intended for non-specialists at the advanced undergraduate level or above. SFI Professor John Miller is executive editor of the series.

**Market in high definition continued from page 1**

Another lesson has been the profound effects of leverage. Leverage, in which borrowed money is used to increase an individual's or company's investments, boosts gains and losses alike. It can drive economic growth, but only in healthy dosages; too much leverage helped contribute to the crises in 2008, and too little leverage has slowed the recovery. The various roles leverage plays in market swings and how they interact remain unclear.

These knowledge gaps prompted SFI researchers Stefan Thurner, Doyne Farmer, and John Gnanakopoulos to model financial markets using a few major types of players. Their simulations included both traders, investors, and investors and attempted to emulate real-world behavior, showing how greater leverage lowers prices and how feedback mechanisms emerge.

"Leverage is a classic example of something that creates nonlinear feedback loops — a central principle in complex systems," says Doyne, an SFI Professor.

The new NSF grant (with SFI's Fabrizio Lillo) will look at the model and its network of borrowers and lenders, with more choices for banks and investors, will offer insights into optimal leverage and uncover more network effects, Doyne believes.

"This is an exciting chance to better understand what causes financial crises — a trillion-dollar problem — and shed light on generic problems in complex systems," he says. "Our dream would be to advise policymakers on how to set leverage to make the system work efficiently."

**Research News**

**Scientists + Google + Facebook = better climate modeling**

Creating a comprehensive model of global climate change involves much more than mapping out and testing patterns in the world's forests, oceans, or atmosphere.

To learn about the complex way the earth is transforming, you need to build a dynamic planetary picture that includes policy decisions, human behavior, and technological strategies, according to SFI External Professor Jim Crutchfield, director of the Complexity Sciences Center at UC Davis.

But assembling a large-scale model that pulls all those facets together requires a massive amount of computer and brain power — not just from one place, but from all over the world. That's why SFI and Jim led that to jump into Google and Facebook for network-enabled solutions, he says.

**RESEARCH NEWS**

**Informing U.S. policy in the Middle East**

An SFI working group in February will explore how data, examined through a complexity lens, might inform U.S. policy makers as they encourage long-term sustainable development in conflict-prone nations such as Afghanistan and Pakistan.

"Developing foreign policy is a very complex endeavor, and policy makers need more tools to lend focus to the challenges of sustainable development," says meeting organizer Bill Frej, a former United States Agency for International Development (USAID) mission director for Afghanistan who is spending a year as SFI's first Diplomat in Residence. "I think SFI and the academic community can be a positive force in looking at policy problems that are both highly scientific, evidence-based, responsible less than in the past."

The February 23-25 meeting, "Frontiers of data analysis: Foreign policy as a complex system," brings together leading scholars and senior-level policy makers and practitioners from the U.S., Afghanistan, and Pakistan. SFI researchers will lead discussions about data analysis, collection, and potential application to policy issues.

Participants will explore data-based approaches to sustainable development, and the co-option of natural resources in Afghanistan.

Watch him discuss his work in an online interview at www.santafe.edu/news.
In addition, following on the great success of Melanie Mitchel’s short course on complexity, we are going to do more short courses for professionals and others interested in complexity science, in a number of venues.

For the future, we need to broaden our base of support and not be as reliant as we have been on a limited number of funding agencies or a limited number of corporations. Many of these corporations are particularly generous, so that a significant dip in one source will not be catastrophic to our work. We need to diversify. That’s our adaptive strategy.

Update: You’ve said that despite the austerity, SFI’s science has remained strong. How?

Jerry: That’s right. Given the situation we’re in, we’re still functioning well. Our science has not suffered significantly. David Krakauer has found creative ways to bring sabbatical visitors here at all little or no cost to us, and he’s worked with people who are proposing workshops and working groups and finding ways to share the costs with them so that we can maintain the necessary level of activity. Even the small stringencies continue to hold, it will expand the number of scholars we can host and the number of workshops and working groups we can have in 2011. Over the long term, that could be a detriment to our science.

Beyond those, there is a lot of other fantastic work going on at SFI in understanding cognition, the chemical origins of life, human behavior, ecological complexity, technological evolution, and many other areas too numerous to mention here. Those are all interesting problems in their own right. They all require a transdisciplinary approach where the tools of physics, the natural sciences, history, the humanities, and the law come to bear on the underlying problems. Studying them in this way is giving us new insights and new perspectives and building our theoretical understanding of complex systems generally. And I have a sense that someday each of them will emerge as really significant societal concerns.

On a more pragmatic note, we have thought about many of these issues for a long time on a relative shoestring, so it’s going to bring us into some much more intellectual firepower — more researchers and more postdocs, and have access to more data — so that we can make indelible contributions to all of them.

Update: After 17 months as SFI’s President, what do you see as the Institute’s special role in the world?

Jerry: At the most basic level what complex systems science reveals is that the systems we rely on as human beings have very significant internal connections, and making them flexible enough so that T leads to X leads to Y leads to Z is, if you simply change X it may have all kinds of unanticipated and surprising system-wide changes that we all have to know about or we may lose them, and so we better understand these system better if we want to work, I think our society needs to be thinking in terms of complex systems. We can see it clearly in all the recent discussions of the economy and the solution to it. And we know that many of the ties underlying many of the other systems we are concerned about — urbanization, ecology, climate and conflict, and we know that some of the ties underlie many of the other systems we are concerned with — urbanization, ecology, climate and conflict, and we know that if we are not able to understand the way that the world is connected, the way in which some of the communities are explained, the way the system works, and so on, we are not able to know the system.

So SFI is making and is in a position to make fundamental contributions to scientific theory and to society. If anything I’m even more impressed today by what SFI does that when I arrived. And I am confident that the SFI model has been successful and it is the right one – a small resident faculty core, an active postdoc influence, a solid group of graduate faculty and science board members, plenty of transdisciplinary collaboration, and an environment for creative work that is unfettered by the constraints of a university or government agency. This way of thinking, and of doing science, and of understanding complex systems is explaining power across the realm of human experience. That is clear by the number of SFI-like institutions that have sprung up all over the world. But SFI is still the driving force behind complexity science, and we still have a long way to go to find the common principles underlying all complex systems. My own ambition is to build a foundation that maintains SFI as a special place and that enhances its ability to make even bigger contributions for at least another 25 years.

Update: Several of SFI’s research areas are just now beginning to worry about as a society, are going to result in a great deal of conflict.

Jerry: Yes, I think that’s a very good point. One of the significant things that we are just now beginning to worry about as a society...are going to result in a great deal of conflict. Note that his company is an example of small and large businesses innovating in a very similar way that influences an entire industry.

Cerebelink is BNet’s first exploratory member

SFI’s Business Network

Cerebelink is BNet’s first exploratory member

For $10,000 (a quarter of the full Business Network membership fee) an Exploratory Member receives all BNet mailings and can send up to two participants each to two top meetings and to SFI’s annual meeting. Within the second year as an Exploratory Member, the company can choose full BNet membership or opt out.

“we think the Exploratory Membership helps give smaller companies a chance to participate and gauge whether membership is valuable to them,” says Chris.

In November the Network welcomed its first exploratory member, Cerebelink Inc. Cerebelink President Rod Sanchez says the perspective a small business like his brings to an issue is different than that of a big company. He notes that his company is an example of small and
SFI’s 2011 Public Lecture lineup

SFIs Public Lectures for 2011 will continue to explore the frontiers of complex systems science and its relevance to many of human society’s most significant problems. The series kicks off March 2 with SFI Diplomat in Residence Bill Frej on the complexities of sustainable development in Afghanistan.

All lectures are at the James A. Little Theater in Santa Fe and begin at 7:30 p.m. The 2011 lineup includes:

- **Wednesday, March 2** - “Conflict to sustainable development: The complexities of a way forward in Afghanistan,” SFI Diplomat in Residence Bill Frej, career minister in the United States Foreign Service and former USAID mission director in Afghanistan
- **Wednesday, April 13** - “Post–quantum cryptography,” SFI Professor Cris Moore, professor of computer science, physics, and astronomy, University of New Mexico
- **Wednesday, May 18** - “Risk in financial markets,” Andrew Lo, Harris & Harris Group, professor in the MIT Sloan School of Management and director of the MIT Laboratory for Financial Engineering
- **Wednesday, June 29** - “Collective behavior: From cells to animals to us,” Lain Coutin, assistant professor of ecology and evolution biology, Princeton University
- **Wednesday, August 17** - “The ecology of indoor environments,” SFI External Professor Jessica Green, University of Oregon and associate professor, Center for Ecology and Evolutionary Biology, and director, Biology and the Built Environment Center
- **Tuesday, Wednesday, Thursday, September 13, 14, & 15 - SFI’s 2011 Ullam Memorial Lectures: “The emergence of intelligence on Earth,” SFI Professor David Krakauer
- **Wednesday, October 12** - “Copyright in the digital age,” Molly Van Houweling, faculty director, Berkeley Center for Law & Technology; UC Berkeley

In the distinguished lecture at the American Anthropological Association’s 2010 annual meeting, SFI President Jerry Stahff examines the importance of communication between anthropologists and their publics.

On October 11, the New American Society for the Arts 2010 Festival of Art and Culture will feature talks, demonstrations, and performances by contemporary artists.

In an SFI seminar, SFI Miller Scholar Seth Lloyd of MIT presents a simple statistical mechanical model of how financial systems become unstable due to debt and draws parallels between the mathematical “collapse” conditions that give rise to both bankruptcy and black holes.

SFI Online

Multimedia and supplementary content available at www.santafe.edu

**Audio:** Looking back on progress in quantum physics
A November 12 NPR Science Friday interview, Science News editor Tom Siegfried highlights the contributions to quantum computing by SFI Distinguished Fellow Murray Gell-Mann and External Professor James Hartle.

**Video:** Why cities survive and companies die
In a Yahoo! Labs “Big Thinkers” presentation, SFI’s Geoffrey West explains why cities survive and companies die.

**Q&A:** Statistical mechanics meets earthquake modeling
In an online interview, SFI External Professor John Rundle discusses his work to apply statistical mechanics to earthquake modeling.

**Video:** Saving for the future

SFI’s stewards of the future are open to the public, and I was intrigued. On at SFI, the colloquia, the lectures that are open to the public, and I was intrigued. I later visited with SFI VP for Development Nancy Deutch and got to meet some of the researchers and leadership.

Jenne Britell is Chairman of the Board of United Rent- als, Inc., the world’s largest equipment rental company. She is also a director of Crown Holdings, Inc., Quest Diagnostics, Inc., the U.S. Russia Investment Fund, and the U.S. Russia Foundation for Educational and Cultural Exchanges, a group that serves as a de facto Fulbright Program. She has held senior management positions at several major corporations and has served on many boards of directors. She was just named one of six Outstanding Directors of public companies for 2011 by the Outstanding Directors Exchange, a division of the Financial Times. Her thoughts follow:

**Update:** When did you first hear about SFI?

Jenne: I know when I think about the Institute for years. It really came to my attention just over a year ago when I sat next to SFI Science Board member Liz Bradley at the 10th anniversary of the Radcliffe Institute for Advanced Study. Liz told me about the research going on at SFI, the colloquia, the lectures that are open to the public, and I was intrigued. I later visited with SFI VP for Development Nancy Deutch and got to meet some of the researchers and leadership.

Jenne Britell: SFI fosters a ‘life of the mind’

Jenne Britell is Chairman of the Board of United Rent- als, Inc., the world’s largest equipment rental company. She is also a director of Crown Holdings, Inc., Quest Diagnostics, Inc., the U.S. Russia Investment Fund, and the U.S. Russia Foundation for Educational and Cultural Exchanges, a group that serves as a de facto Fulbright Program. She has held senior management positions at several major corporations and has served on many boards of directors. She was just named one of six Outstanding Directors of public companies for 2011 by the Outstanding Directors Exchange, a division of the Financial Times. Her thoughts follow:

**Update:** Why is SFI’s work meaningful to you?

Jenne: I have always been interested in a “life of the mind,” and I think there is great opportunity for research that crosses disciplines. I know SFI doesn’t use the word “applied” very often, but I think there is enormous potential to translate its work into outcomes that are good for civilization. In particular, I think the effort of SFI to make this kind of work is important. Also, I started my career as a historian, so the histo- ry-writing work that SFI Faculty Chair David Krakauer is doing is interesting to me. And I’m struck by the Institute’s science and math education programs for young people. The more I learn about SFI, the more of its work I find fascinating.

**Update:** What are the most important contri- butions SFI can make?

Jenne: The Institute attracts outstanding scholars from many different fields to work on a variety of problems, which is important in its own right. The knowledge we have today is a result of such thinking in the past. If we want society to move forward, we need to have places where a life of the mind flourishes. There are so many compelling needs and questions right now. Places like SFI must be supported.