



# Update

April 2008



Children at Chinese New Year parade learn, and influence, cultural traditions.

(Image Serguei Bachlakov, Dreamstime.com)

## RESEARCH NEWS

### Workshop: Why and how culture evolves

Why do longstanding cultural phenomena such as marriage customs change over time? Why do certain forms of cultural variation persist over generations while others perish? These are some of the questions researchers will consider at SFI this month.

The workshop, "The Role of Variation in Culture: Updates in Cultural Evolution," is being organized by Stanford faculty members James Truncer, Melissa Brown, and Marcus Feldman (SFI Science Steering Committee Member and External Professor). The School for Advanced Research, a Santa Fe-based anthropological research center (formerly the School for American Research), is co-sponsoring the event, to be held April 15-18 at SFI.

Although the notion of cultural variation has long been accepted, scholars know little about it, Brown says. "The next steps in formulating a more complete theory of cultural evolution relate to questions of variation," she says. "We

think a Darwinian evolutionary perspective can ultimately help us better understand cultural change."

This perspective has proven successful in making sense of biological complexity, of which humans are a part, Brown says. "However, in extending Darwinian perspectives beyond genetic transmission, we need to take into account the unique attributes of cultural phenomena and the social orders in which they are embedded," she says.

The 24 invited participants represent anthropology, archaeology, biology, classics, economics, history, political science, and sociology. A planned edited volume on cultural variation from each of these perspectives has the potential to unify diverse multi-disciplinary interests on the topic, says Truncer.

"We face an exciting, if somewhat daunting, task that will require cross-disciplinary cooperation and debate," adds Brown. ■



During a religious festival in 1991 Taiwan, clothing styles from different cultures are mixed. The man in blue scholar's robes represents the traditional Han Chinese culture; the woman in peasant clothes and the man in the vest represent the indigenous Taiwanese culture. In a break from social custom, the men listen to the young woman, who is in a trance speaking with the authority of a deity. (Photo by Melissa J. Brown)

## IN THIS ISSUE

- > Lit Bits 2
- > Conformists fare well 2
- > Gintis in Science 2
- > SFI's financial ecology 3
- > Gorbachev lecture 3
- > Science indicators 3
- > SFI in the News 4

## RESEARCH NEWS

### Moral thinking: Are we overlooking altruism?

The 18th century philosopher David Hume's constitutional axiom has guided economists designing markets and policies around the world ever since: "In contriving any system of government...every man ought to be supposed to be a knave and to have no other end, in all his actions, than his private interest."

But SFI Professor Sam Bowles wonders: What if some people aren't knaves, or at least aren't knaves all the time?

"You might get it wrong then," Sam says. "In fact, there is tremendous experimental evidence that not only might you get it wrong, you very often get it wrong." That means poorly designed social institutions are failing to take advantage of people's altruism and civic-mindedness, he suggests.

At the annual meeting of the American Association for the Advancement of Science in February, Sam presented recent research that has culminated in a series of papers in *Science*, *Nature*, the *Journal of Theoretical Biology*, and *Theoretical Population Biology*. *The Economist* devoted a full page to the AAAS panel discussion under the headline "Moral Thinking," which included papers by Sam, Harvard psychologist Marc Hauser, and SUNY biologist David Sloan Wilson.

Sam notes that in economic games, people are willing to punish those who don't cooperate, even at a cost to themselves and even when they themselves aren't the victims of the cheating. Real world experiments

> more on page 2

## LIT BITS

Shrinkage and spectral filtering of correlation matrices: A comparison via the Kullback-Leibler distance; Tumminello, M.; **Lillo, Fabrizio [SFI External Professor]**; Mantegna, R.N.; *Acta Physica Polonica B* 38 (13 SP ISS), 2007, pp. 4079-4088

The eigenvalue spectrum of lagged correlation matrices; **Thurner, Stefan [SFI External Professor]**; Biely, C.; *Acta Physica Polonica B* 38 (13 SP ISS), 2007, pp. 4111-4122

RNA strand: Reading direction of structured RNAs in multiple sequence alignments; Reiche, K.; **Stadler, Peter [SFI External Professor]**; *Algorithms for Molecular Biology* 2, May 31, 2007

Spanning trees and bootstrap reliability estimation in correlation-based networks; Tumminello,

M.; Coronello, C.; **Lillo, Fabrizio [SFI External Professor]**; Micciche, S.; Mantegna, R.; *International Journal of Bifurcation and Chaos* 17 (7), July 2007, pp. 2319-2329

Unanimity rule on networks; Lambiotte, R.; **Thurner, Stefan [SFI External Professor]**; Hanel, R.; *Physical Review E* 76 (4 pt 2), October 2007, pp. 49-56

Centralized HIV-1 envelope immunogens and neutralizing antibodies; Gao, F.; Liao, H.X.; Hahn, B.H.; Letvin, N.L.; **Korber, Bette [SFI Science Steering Committee Member and External Professor]**; Haynes, B.F.; *Current HIV Research* 5 (6), November 2007, pp. 572-577

Comment on 'A critical understanding of the fractal model of metabolic scaling'; Savage, V.M.;

**Enquist, Brian [SFI External Professor]**; **West, Geoffrey [SFI President and Distinguished Professor]**; *Journal of Experimental Biology* 210 (21), Nov. 1, 2007, pp. 3873-3874

CREx: Inferring genomic rearrangements based on common intervals; Bernt, M.; Merkle, D.; Ramsch, K.; Fritsch, G.; Perseke, M.; Bernhard, D.; Schlegel, M.; **Stadler, Peter [SFI External Professor]**; Middendorf, M.; *Bioinformatics* 23 (21), Nov. 1, 2007, pp. 2957-2958

Computational RNomics of drosophilids; Rose, D.; Hackermuller, J.; Washietl, S.; Reiche, K.; Hertel, J.; Findeiss, S.; **Stadler, Peter [SFI External Professor]**; Prohaska, S.J.; *BMC Genomics* 8, Nov. 8, 2007

Animal cell differentiation patterns suppress

somatic evolution; **Pepper, John [SFI External Professor]**; Sprouffske, K.; Maley, C.C.; *PLOS Computational Biology* 3 (12), December 2007, pp. 2532-2545

Hierarchical small-worlds in software architecture; Valverde, S.; **Solé, Ricard [SFI External Professor]**; *Dynamics of Continuous Discrete and Impulsive Systems-Series B-Applications & Algorithms* 14; December 2007, pp. 1-11

Imprinted genes and human disease: An evolutionary perspective; Ubeda, F.; **Wilkins, Jon [SFI Professor]**; *Genomic Imprinting* 626, 2008, pp. 101-115

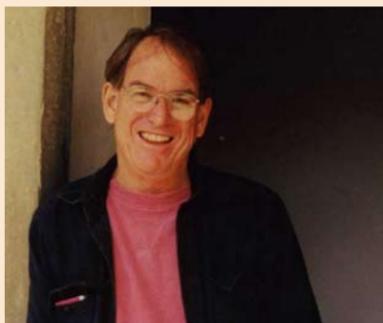
Introduction to special issue on 'Applications of Statistical Physics in Economics and Finance'; **Farmer, J. Doyne [SFI Professor]**; Lux, T.;

## > Moral thinking continued from page 1

have also shown that people are far more generous than rigid self-interest would seem to dictate. These results show that many humans are genuinely altruistic, Sam argues.

As the world becomes more interconnected and the resulting challenges to humanity increase, learning to harness these altruistic impulses becomes even more important, he says.

Thus, the economists' goal of designing institutions and policies to direct the selfish impulses of individuals to public ends "will be necessary but insufficient," Sam says. "The moral nature of humans must also be recognized, cultivated, and empowered." ■



Sam Bowles

## ON & OFFS

For SFI's schedule of workshops, lectures, and colloquia: [www.santafe.edu/events](http://www.santafe.edu/events)

## COMINGS & GOINGS

For a schedule of SFI visitors: [www.santafe.edu/events/calendar-visitors-week.php](http://www.santafe.edu/events/calendar-visitors-week.php)

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## RESEARCH NEWS

# Running with the herd: Conformists fare well

Lone wolves may get all the glory, but it can be just as profitable to run with the herd.

That is one insight from "Conformists and mavericks: The empirics of frequency-dependent cultural transmission," which appeared in the January issue of *Evolution and Human Behavior*. The study takes established models of social influence to task, arguing for a more precise formal definition of conformity and presenting an experiment to probe the group-level dynamics of social learning.

In the experiment, volunteer subjects made a series of economic decisions based on either individual or group-aggregated feedback. Individual learners did fairly well, accruing decent profits after some trial and error.

Social learners performed well or poorly in proportion to how temperamentally conformist they were, which was assessed by questionnaire. Strong conformists saw the biggest payoffs, out-earning even the individual learners. In contrast, social learners who were disinclined to follow the crowd performed abysmally.

Though conformity was the optimal strategy in this instance, the experiment could just as easily have been designed differently to make conformity a losing strategy, says lead author Charles Efferson, a Post-



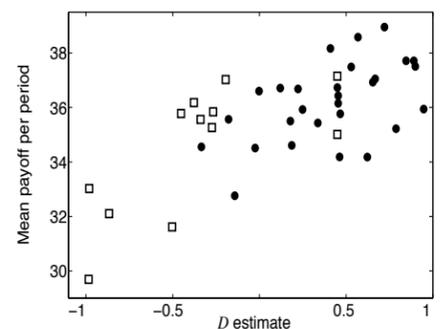
Charles Efferson

doctoral Fellow at both SFI and the University of Zurich.

"Conformity by itself is morally and strategically neutral," he says. "What conformity does is exaggerate other biases. It can act as a filter that amplifies the successful strategies being developed by individuals within the population." In other contexts, he noted, it can cause non-optimal or arbitrary practices to become entrenched.

In general, Charles adds, social psychologists tend to focus too narrowly on individuals. They often do not design their experiments to allow extrapolation between individual behavior and aggregate dynamics,

even though these two levels of social and economic systems are manifestly intertwined. ■



Profits correlate with conformity. How conformist a person tended to be (+1 strongly conformist, -1 strongly nonconformist) is represented on the x-axis. Solid circles are self-declared conformists; open squares are non-self-declared conformists.

## RESEARCH NEWS

# Science piece reviews multi-nation behavioral study



Herbert Gintis

In a Perspectives piece that appeared in the March 7 issue of *Science*, SFI External Professor Herbert Gintis (professor of economics at the Central European University) reviewed recent behavioral game theory research by Benedikt Herrmann (University of Nottingham), Christian Thöni (University of St. Gallen), and Simon Gaechter (University of Nottingham).

Their paper, which also appeared in the March 7 *Science*, suggests that

systematic differences across societies affect people's capacity to cooperate effectively.

"Behavioral game theory has shown itself increasingly capable of identifying systematic behavior patterns that have been overlooked in more traditional forms of empirical analysis," Herbert says.

Using cooperative games, Herrmann *et al.* collected data in 15 countries with varying levels of economic development. They found that university students in democratic societies with advanced market economies rarely exercised a type of antisocial punishment featured in the game, while this punishment was commonly exercised

by students in traditional societies based on authoritarian and parochial social institutions.

"The authors' empirical results show that the advanced market societies with democratic institutions produce an ethic of spontaneous cooperation, with a strong altruistic dimension, that likely accounts at least in part for their material success and legitimacy," says Herbert.

He adds that like results from any single study, this study's results must be validated and extended before firm conclusions can be drawn. ■

*Journal of Economic Dynamics & Control* 32 (1), January 2008, pp. 1-6

Classical thermodynamics and economic general equilibrium theory; **Smith, Eric [SFI Professor]**; **Foley, Duncan [SFI External Professor]**; *Journal of Economic Dynamics & Control* 32 (1), January 2008, pp. 7-65

An empirical behavioral model of liquidity and volatility; Mike, S.; **Farmer, J. Doyne [SFI Professor]**; *Journal of Economic Dynamics & Control* 32 (1), January 2008, pp. 200-234

Cluster analysis for portfolio optimization; Tola, V.; **Lillo, Fabrizio [SFI External Professor]**; Gallegati, M.; Mantegna, R.N.; *Journal of Economic Dynamics & Control* 32 (1), January 2008, pp. 235-258

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Targeting of a CD8 T cell Env epitope presented by HLA-B\*5802 is associated with markers of HIV disease progression and lack of selection pressure; Ngumbela, K.C.; Day, C.L.; Mncube, Z.; Nair, K.; Ramduth, D.; Thobakgale, C.; Moodley, E.; Reddy, S.; de Pierres, C.; Mkhwanazi, N.; Bishop, K.; van der Stok, M.; Ismail, N.; Honeyborne, I.; Crawford, H.; Kavanagh, D.G.; Rousseau, C.; Nickle, D.; Mullins, J.; Heckerman, D.; **Korber, Bette [SFI Science Steering Committee Member and External Professor]**; Coovadia, H.; Kiepiela, P.; Goulder, P.J.R.;

Walker, B.D.; *AIDS Research and Human Retroviruses* 24 (1), January 2008, pp. 72-82

Linking traits to energetics and population dynamics to predict lizard ranges in changing environments; **Buckley, Lauren [SFI Postdoctoral Fellow]**; *American Naturalist* 171 (1), January 2008, pp. E1-E19

Amplified temperature dependence in ecosystems developing on the lava flows of Mauna Loa, Hawaii; Anderson-Teixeira, K.J.; Vitousek, P.M.; **Brown, Jim [SFI Science Steering Committee Member and External Professor]**; *Proceedings of the National Academy of Sciences of the United States of America* 105 (1), Jan. 8, 2008, pp. 228-233

SnoReport: Computational identification of

snoRNAs with unknown targets; Hertel, J.; Hofacker, I.L.; **Stadler, Peter [SFI External Professor]**; *Bioinformatics* 24 (2), Jan. 15, 2008, pp. 158-164

Matching allele dynamics and coevolution in a minimal predator-prey replicator model; Sardanyes, J.; **Solé, Ricard [SFI External Professor]**; *Physics Letters A* 372 (4), Jan. 21, 2008, pp. 341-350

Structure and function of the smallest vertebrate telomerase RNA from teleost fish; Xie, M.Y.; Mosig, A.; Qi, X.; Li, Y.; **Stadler, Peter [SFI External Professor]**; Chen, J.J.L.; *Journal of Biological Chemistry* (4), Jan. 25, 2008, pp. 2049-2059

## INSIDE SFI

# Institute VP Chris Wood describes SFI's diverse financial ecology

SFI's financial outlook for 2008 and beyond is "increasingly strong, but SFI's goal of achieving long-term financial stability is still to be achieved," says Institute Vice President Chris Wood.

"Meeting yearly revenue goals and developing sources of longer-term support continue to be major SFI priorities," he says.

**SFI's financial diversity "allows us to keep our attention on the top priority – truly transformative science."**

The budgets for 2007 and 2008, both about \$11.5 million, are 20 percent higher than in previous years, he says, reflecting increasing activity in SFI's science and education programs. Successes in SFI's grants program and private fundraising efforts have enabled those increases.

Key elements in this success, says Chris, are: 1) NSF's approval of a number of grants, including the five-year, \$4.25 million grant "A Broad Research Program in the Sciences of Complexity," 2) major gifts in support of SFI science by Trustees and other donors, and 3) the continuing growth and vitality of SFI's Business Network.

But beneath this favorable surface is a complex and diverse financial ecology, he says, with delicate balances vulnerable to disruption.

## Diverse sources

SFI's intentionally diverse portfolio of funding sources is developed and monitored through annual and long-term financial plans by SFI management and the Trustee Finance Committee, explains Chris.

In a typical year, research grants from federal agencies (such as the NSF and NIH) and from private foundations represent 35 to 40 percent of SFI's budget. Donations from individuals and small foundations comprise another 35 to 40 percent. The Business Network accounts for another 15 to 20 percent. The final 5 to 10 percent represents income on investments.

SFI's Trustees and Finance Committee regularly address the balance of public, private philanthropic, corporate, and investment funds, says Chris, and they recognize that all four sources are vital for sustaining SFI's unique research character.

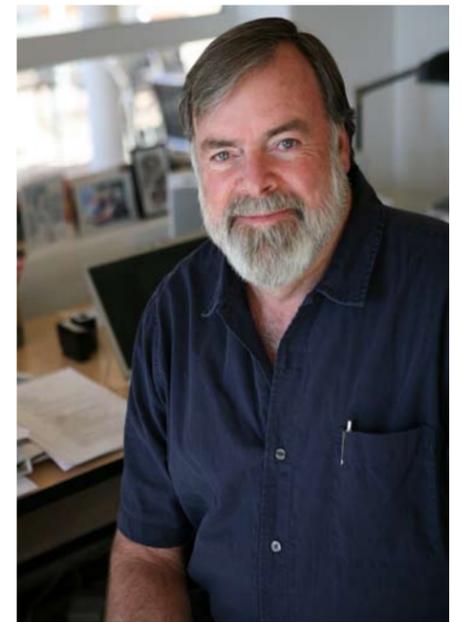
Success in federal grant competition, for example, helps gauge the quality of the Institute's research and provides private donors confidence that the Institute is a worthy investment, he says.

SFI competes well in the federal arena. The Institute's overall success rate for NSF grants is about 30 percent compared to an average success rate of about 10 percent of all proposals NSF receives. Federal grants also provide a means for SFI researchers to stay connected to their peers.

Private donations allow the Institute to explore high-risk, high-payoff research that is deemed by federal sponsors to be too premature, too risky, or too far outside their traditional domains for research funds. Many of SFI's most successful projects have begun as small investments with modest amounts of private funds. Without private support, Chris says, much of the Institute's most innovative transdisciplinary research never would have matured into research initiatives funded through more traditional channels.

"The Business Network is an unusual funding source for an institution whose focus is on fundamental research," Chris says. "Businesses are often eager to pay for solutions to their specific problems, but SFI is not in the project-oriented, 'research for hire' business."

SFI Business Network members pay membership fees to be part of SFI's community of forward-thinking individuals. "Our members tell us that engaging in the intellectual and scientific milieu of SFI is an excellent way to gain new perspectives on challenges facing their organizations," he says.



Chris Wood

The fourth category of revenue is investment income. Unlike institutions with major endowments, the Institute today must raise a significant portion of its operating income annually. The initial goal of SFI's 25th Anniversary Campaign next year is to raise sufficient resources so that investment income can increase to at least 20 percent of the Institute's annual budget.

Maximizing the amount of available funds devoted to research requires that the Institute remain vigilant in controlling administrative costs, Chris adds. "We are very proud that SFI's administrative costs have remained almost

> more on page 4

## INSIDE SFI

# Gorbachev lecture nearly sold out

An April 14 public lecture in Santa Fe by Nobel Peace Prize winner and former Soviet President Mikhail Gorbachev is nearly sold out.

New Mexico Governor Bill Richardson is scheduled to introduce the lecture, "Gorbachev on Leadership: From the End of the Cold War to the Growing Environmental Crisis."

Tickets at the introductory level (\$35) sold out 12 minutes after they went on sale March 10, says Shannon Larsen, SFI Executive Director for Development and Corporate Relations.

**Mikhail Gorbachev**  
April 14, 6 p.m. - Lensic Theatre

Lecture tickets at the \$100 level are still available through the Lensic, Santa Fe's Performing Arts Center, where the event is being held. Admission to a pre-lecture cocktail reception also is available for a tax-deductible donation of \$500 per person, says Shannon. This includes priority seating at the lecture.

Long-time SFI friend Gerald Peters and the Peters Family Art Foundation arranged and supported the President's visit.

For more information about the events, visit [www.santafe.edu/events](http://www.santafe.edu/events), or contact Kay Frew for cocktail reception admission at 505-946-3678 or [kfrew@santafe.edu](mailto:kfrew@santafe.edu). ■

# National Science Board releases science 'Indicators for 2008'

The National Science Board early this year released its "Science and Engineering Indicators for 2008." The 875-page policy-neutral report is provided to the President and Congress every two years. A few of its conclusions:

■ Federal funding for academic research is now declining after adjusting for inflation, with this trend continuing in 2008 and 2009.

■ Science and engineering PhD degree attainment is again rising in the United States.

■ Federal R&D spending continues a three-decade trend of being heavily weighted toward defense programs, with significant growth in health research spending.

■ The percentage of those asked whether the federal government should fund basic research is at its highest point (87%), as is the percentage (41%) of those who feel the federal government is spending too little on research.

The full report is available at [www.nsf.gov/statistics/indicators](http://www.nsf.gov/statistics/indicators).

## SFI IN THE NEWS

The Jan. 8 *The American Naturalist* published a paper by SFI Postdoctoral Fellow Lauren Buckley in which she describes her work to model the energy use of individual animals and populations. She warns climate change modelers to consider potentially important aspects of a species' biology, including size, physiology, and behavior, when determining how it might be affected by global warming. [www.journals.uchicago.edu/doi/pdf/10.1086/523949](http://www.journals.uchicago.edu/doi/pdf/10.1086/523949)

The Jan. 28 issue of *The Daily Cat* discusses the work of SFI Postdoctoral Fellow Sander van Doorn, describing him as one of the world's leading experts on the evolution of personality in animals. He says such traits as personality are what help to characterize uniqueness among individuals. In other words, no two cats or humans think and behave exactly alike. [www.thedailycat.com](http://www.thedailycat.com)

SFI External Professor Duncan Watts (Columbia University) says in a February 2008 *Fast Times* article, "Is the Tipping Point Toast?", that particularly influential people don't dominate trend-setting as once thought. Society's susceptibility is even more important than persuasiveness. "If society is ready to embrace a trend, almost anyone can start one – and if it isn't, then almost no one can," he says. [www.fastcompany.com/magazine/122/is-the-tipping-point-toast.html?page=0%2C4](http://www.fastcompany.com/magazine/122/is-the-tipping-point-toast.html?page=0%2C4)

In an opinion piece, "The Coming Ad Revolution," in the Feb. 11 *The Wall Street Journal*, SFI Trustee Esther Dyson (editor-at-large, CNET Networks) says more effective future online marketing tools will target the self-professed preferences and behaviors of purchasers in online social networks,

in effect allowing users to select their advertising. <http://online.wsj.com/article/SB120269162692857749.html>

SFI Science Board Member, Science Steering Committee Member, and External Professor John Geanakoplos (Yale University) in the February 20 *The Wall Street Journal* describes how negative-feedback loops are driving today's economy. "When times are good, credit is ample, causing the economy to heat up," says the article. "When the cycle shifts, lenders tighten standards and become more demanding about the collateral they hold." Sudden shifts catch investors and policy makers off guard, it says. [http://online.wsj.com/article\\_print/SB120347212951278871.html](http://online.wsj.com/article_print/SB120347212951278871.html)

The Feb. 21 issue of *Nature* examines ways research institutions are removing barriers to cross-disciplinary research. SFI President and Distinguished Professor Geoffrey West said (on finding good researchers): "You need a person with a passion for a bigger picture of science, who can see beyond boundaries and wants to see where the threads of their ideas might lead in other contexts." But, he adds, "There are extraordinarily smart and creative people that don't care about anything outside their discipline. And there are flaky people who are interested in everything at a very superficial level." The author is former SFI visitor John Whitfield. [www.nature.com](http://www.nature.com)

A study SFI Science Steering Committee Member and External Professor Marcus Feldman (Stanford University) took part in was featured widely in the news media, including in the Feb. 21 *National Geographic*:

"A massive new study of human genetic diversity reveals surprising insights into our species' evolution and migrations – including support for the theory that the first modern humans originated in Africa... 'You get less and less variation the further you go from Africa,' said Marcus Feldman, an evolutionary biologist at Stanford and a study co-author." [www.sciencemag.org/cgi/content/short/319/5866/1100](http://www.sciencemag.org/cgi/content/short/319/5866/1100)

A Feb. 24 post in *Nanotechnology Now* featured an account of a visit to SFI by Anita Goel (Harvard University). "I find it intriguing," says Goel, "that conditions within cells can affect the flow of information encoded in DNA." It all sounds complex, but for Goel this is what she always wanted to do and get. While visiting the Santa Fe Institute in New Mexico, Goel began thinking more deeply about theories that might adequately describe the interaction of DNA molecular motors with their environment." [www.nanotech-now.com/news.cgi?story\\_id=28188](http://www.nanotech-now.com/news.cgi?story_id=28188)

A post in the March 5 *Business Day* mentions SFI Professor Doyne Farmer's research to build a stock market model in which agents with zero intelligence placed random orders to buy and sell stocks at a given price. When applied to London Stock Exchange data from 11 real stocks collected over 21 months, "the model surprisingly predicted 96% of the spread variance and 76% of the variance in the price diffusion rate," the article said. The researchers conclude that it might be possible to lower market volatility simply by tinkering with transaction costs, it said. [www.businessday.co.za/articles/markets.aspx?ID=BD4A720113](http://www.businessday.co.za/articles/markets.aspx?ID=BD4A720113)

## > *Financial ecology* continued from page 3

constant and are well below average for research institutions," he says.

"SFI's financial diversity is extremely important because it makes us more robust both against business cycles and fluctuations in federal funding," he says. "This allows us to keep our attention on the top priority – truly transformative science."

## Future challenges

But there are some real challenges in the future, Chris says, such as the tendency for funding agencies to specify in increasingly precise terms the specific "deliverables" for a given grant or donation. This trend is fostering increasingly constrained grant processes, conservatism in grant reviews, and overly constrained grant oversight.

"In a sense this is understandable – sponsors want to see tangible results," he says. "But in another sense, it is antithetical to the premise of fundamental research.

"Although this trend has been echoed in philanthropic giving nationwide," he says, "SFI continues to attract visionary philanthropists who understand the need to donate unrestricted funds.

"The good news is we've been able to avoid having our research 'follow the money'," he says. "We and the Trustees recognize that the flexibility to pursue high-risk, novel ideas is essential to SFI's unique character, and we are committed to maintaining it." ■



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