



# Update

September / October 2010



Egyptian papyrus showing the Pharaoh Tutankhamen and gods Osiris, Hathor, and Isis

(Image: Jose Ignacio Soto, istockphoto.com)

## RESEARCH NEWS

### Comparing worldviews across cultures and time

All human societies, past and present, have a belief system. Comparing these worldviews, or "cosmologies," across cultures may offer glimpses into universal human traits that help define individual cultures.

A September workshop at SFI, "Cosmology and Society in the Ancient Amerindian World," brought together researchers in several fields

including astronomy, linguistics, physics, archaeology, and folklore to explore these universals and examine their adaptation value.

The meeting was co-organized by SFI Distinguished Fellow Murray Gell-Mann and External Professors George Gumerman and Linda Cordell, both with the School for Advanced Research, Archeology, and Anthropology.

A similar workshop was held at SFI two years ago, at which participants compared world views in prehistory societies of the southeastern and southwestern U.S. and Mesoamerica.

The goal for this year's workshop, George says, was to understand the processes that play roles in the evolution of cosmological principles. An edited volume is planned. ■

## RESEARCH NEWS

### Cracking the secrets of viruses

Recent research into the hepatitis C virus (HCV) and influenza has uncovered new challenges in understanding these common, and devastating, viruses.

SFI Science Board member and External Professor Alan Perelson, a viral dynamics modeler at Los Alamos National Lab, recently brought together at SFI a select group of theoreticians and experimentalists to discuss approaches to studying them.

The late-August workshop explored the roles and mechanisms of virus action and drug response. Type I interferon, for example, is an infection-fighting protein that, when applied therapeutically, works about half the time in HCV-infected patients. Why some people respond and others don't is an unresolved

question, as is how to model human response when it varies so greatly.

Also discussed was how the antiviral drug Ribavirin works, and whether it acts



similarly in fighting HCV, influenza, and polio. How resistance to new HCV antiviral drugs develops rapidly was examined as well.

The researchers asked whether lessons learned about one virus can be applied to another.

"I'm hoping the collaborations that were formed here will lead to better understanding and abilities to defend against these viruses," Alan says. ■

Transmission electron micrograph of an influenza RNA virus (Image: Frederick Murphy/CDC)

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## INSIDE SFI

### Institute to assess Templeton Foundation complexity science

SFI will evaluate inquiries the John Templeton Foundation receives on "the science and significance of complexity," a 2010 funding priority for the Foundation.

SFI has agreed to referee portions of letters of inquiry submitted to the Foundation requesting support of proposed research. The Institute will make recommendations, based on the scientific merit of each inquiry, that the Foundation invite full project proposals from selected researchers and institutions. SFI also will evaluate full proposals at a later stage of the review process.

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The Institute's web site now offers lectures, colloquia, and other educational content through YouTube, iTunes U, and video downloads, as well. ■



## LIT BITS

Distant language relationships: The current perspective; **Murray Gell-Mann**; Peiros, I.; Starostin, G.; *Journal of Language Relationship* 1

Analyzing genetic connections between languages by matching consonant classes; Turchin, P.; Peiros, I.; **Murray Gell-Mann**; *Journal of Language Relationship* 3

Intelligent data analysis of intelligent systems; **David Krakauer**; **Jessica Flack**; **Simon Dedeo**; **Doyle Farmer**; **Dan Rockmore**; *Advances in Intelligent Data Analysis IX, Proceedings* 6065, 2010

Genomic organization of eukaryotic tRNAs; Bermudez-Santana, C.; Attolini, C.S.O.; Kirsten, T.; Engelhardt, J.; Prohaska, S.J.; Steigele, S.; **Peter Stadler**; *BMC Genomics* 11, April 28, 2010

Avoiding transcription factor competition at promoter level increases the chances of obtaining oscillation; Munteanu, A.; Constante, M.; Isalan, M.; **Ricard Solé**; *BMC Systems Biology* 4, May 17, 2010

Some novel intron positions in conserved *Drosophila* genes are caused by intron sliding or tandem duplication; Lehmann, J.; Eisenhardt, C.; **Peter Stadler**; Krauss, V.; *BMC Evolutionary Biology* 10, May 26, 2010

New representations of pi and Dirac delta using the nonextensive-statistical-mechanics q-exponential function; Jauregui, M.; **Constantino Tsallis**; *Journal of Mathematical Physics* 51 (6), June 2010

Simple genomes, complex interactions: Epistasis in RNA virus; **Santiago Elena**; **Ricard Solé**; Sardanyes, J.; *Chaos* 20 (2), June 2010

Polynomial algorithms for the Maximal Pairing Problem: Efficient phylogenetic targeting on arbitrary trees; Arnold, C.; **Peter Stadler**; *Algorithms for Molecular Biology* 5, June 2, 2010

Long-term evolution of antigen repertoires among carried meningococci; **Caroline Buckee**; Gupta, S.; Kriz, P.; Maiden, M.C.J.; Jolley, K.A.; *Proceedings*

*of the Royal Society B - Biological Sciences* 277 (1688), June 7, 2010

Using selection bias to explain the observed structure of Internet diffusions; Golub, B.; **Matthew Jackson**; *Proceedings of the National Academy of Sciences* 107 (24), June 15, 2010

Mitochondrial genome evolution in Ophiuroidea, Echinoidea, and Holothuroidea: Insights in phylogenetic relationships of Echinodermata; Perseke, M.; Bernhard, D.; Fritsch, G.; Brummer, F.; **Peter Stadler**; Schlegel, M.; *Molecular Phylogenetics and Evolution* 56 (1), July 2010

A cost-based comparison of quarantine strategies for new emerging diseases; Mubayi, A.; Zaleta, C.K.; Martcheva, M.; **Carlos Castillo-Chavez**; *Mathematical Biosciences and Engineering* 7 (3), July 2010

BarMap: RNA folding on dynamic energy landscapes; Hofacker, I.L.; Flamm, C.; Heine, C.; Wolfinger, M.T.; Scheuermann, G.; **Peter Stadler**; *RNA-A*

*Publications of the RNA Society* 16 (7), July 2010

Community resilience in collaborative learning; Crisosto, N.M.; Kribs-Zelea, C.M.; **Carlos Castillo-Chavez**; Wirkus, S.; *Discrete and Continuous Dynamical Systems Series B* 14, July 2010

Vegetation pattern formation in a fog-dependent ecosystem; Borthagaray, A.I.; **Miguel Fuentes**; **Pablo Marquet**; *Journal of Theoretical Biology* 265 (1), July 7, 2010

Innovation in gene regulation: The case of chromatin computation; Prohaska, S.J.; **Peter Stadler**; **David Krakauer**; *Journal of Theoretical Biology* 265 (1), July 7, 2010

Shifts in metabolic scaling, production, and efficiency across major evolutionary transitions of life; DeLong, J.P.; Okie, J.G.; Moses, M.E.; Sibly, R.M.; **Jim Brown**; *Proceedings of the National Academy of Sciences* 107 (29), July 20, 2010

## PEOPLE

### SFI appointments

The Institute has named two new members to its Science Steering Committee:

- Dan Rockmore, professor, mathematics and computer science, Dartmouth College (effective August 2010)
- Mimi Koehl, professor, integrative biology, UC Berkeley (effective March 2011) ■

### Achievements

SFI Distinguished Fellow Murray Gell-Mann has been named Presidential Professor of Physics and Medicine in the Keck School of Medicine at the University of Southern California.

SFI External Professor Zurek Wojciech (Los Alamos National Lab) has received the Einstein Professorship at the University of Ulm.

SFI External Professor David Sherrington (Oxford) has been awarded the 2010 Blaise Pascal Medal in Physics by the European Academy of Sciences.

SFI External Professor Martin Shubik (Yale) has been named a distinguished fellow of the American Economic Association.

SFI External Professor Simon Levin (Princeton) has received the Catalonia government's Margalef Prize in Ecology and Environmental Sciences. ■

## BUSINESS NETWORK NEWS

### 2010 Fellows

SFI has selected Matthew Koehler and Massimiliano Spaziani for 2010 Business Network Fellowships. Fellows spend two weeks in each of two years at the Institute focused on applying SFI research to critical business problems.

Matthew, a principal engineer in artificial intelligence with The MITRE Corporation, will conduct research on the behavioral underpinnings of recent SFI statistical work on terrorism and warfare.

Massimiliano, with the Internet Media & Digital Communication group at Telecom Italia, will examine the empirical relationship among stock market volatility, Google query volume, and stock trading volume. ■

## CREDITS

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The *SFI Update* is published bi-monthly by the Institute to keep its community informed. Please send comments or questions to John German at [jdg@santafe.edu](mailto:jdg@santafe.edu).

The Institute is on the web at [www.santafe.edu](http://www.santafe.edu).

## RESEARCH NEWS

### Seeking intelligence...and no biology allowed

Human beings are proof that intelligence is possible, but we don't have a monopoly. Computers, although not on par with people for some tasks, compute. Even tiny chemical reactions perform computations.

Perhaps that's where we should be looking for intelligence: embodied in the world around us, says SFI External Professor Jim Crutchfield.

"The paradigm we've come to associate with digital computing is very limited," Jim says, "and there might very well be other kinds of biological, chemical, and physical intelligence that transcend this digital, discrete computation paradigm."

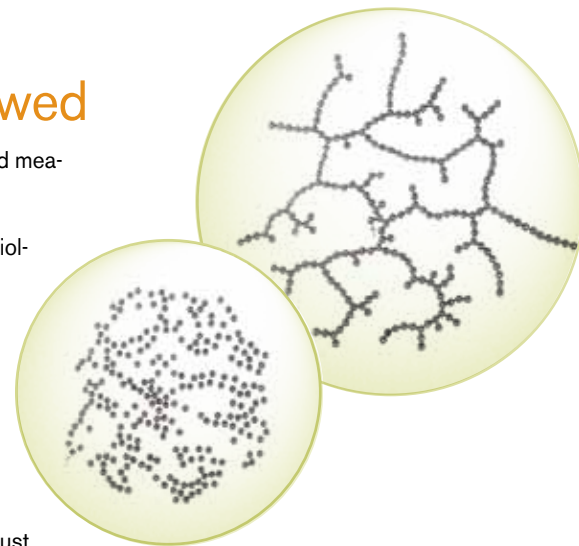
So he and SFI External Professor Arthur Hübler have set out to find it. They've just received a

grant from DARPA to define, identify, and measure intelligence in physical systems.

But they have a strict ground rule: "No biology is allowed," says Jim. "No neurons, no cells, no human being, no subjective criteria like the Turing test."

Instead, they're looking at structures like self-repairing dendritic trees, self-replicating RNA, and metal-organic frameworks.

Furthermore, the intelligence they find must be rigorously measurable, Jim says. "The artificial intelligence model is 'We know it when we see it.' Our physical intelligence model is: 'We know it when we measure it.'" ■



Ball bearings in oil form a tree-like structure when a high-voltage current runs through it. Move one of the balls slightly and it will return to its original position. Scramble the whole structure and a new pattern emerges with the same number of endpoints and branching points. (Images: Alfred Hübler)

## RESEARCH NEWS

### Workshop takes a fresh look at the peopling of the Americas

When the Last Glacial Maximum finally relaxed its grip on the planet, the vanishing glaciers from Beijing to British Columbia allowed people from Asia to trickle into a new world.

The newcomers spread throughout North and South America, where they shaped their cul-

tures around their environments over thousands of years. Much of what we know of these early times has been gleaned through modest data and theoretical tools.

Today, recent advances in biology, language studies, and modeling, along with new ar-

cheological finds, have prompted SFI to hold a workshop that takes a new look at the peopling of the Americas. "It's high time there was a meeting," says SFI Distinguished Fellow Murray Gell-Mann.

Many aspects of how and when people arrived in the Americas are still debated, he says. For example, how strong is the evidence for cultures earlier than the Clovis culture of twelve and a half thousand years ago?

Another example: If we look at the linguistic map of North America, the northernmost layer, Eskimo and Aleut, appears as the latest arrivals, preceded by a layer of "Na-Dene," including Athabaskan and Tlingit. But who arrived just before that? The adjacent layer of "Algic," including Algonquian and related languages? Or is the layer approach too naive?

The September 25-26 "Peopling of the Americas" workshop is co-organized by Murray, SFI External Professor Henry Wright (University of Michigan), and regular SFI visitor Ilia Peiros.

Participants will include geneticists, physical anthropologists, linguists, mythology expert Yuri Berezkin from the Russian Academy of Sciences, and many archaeologists.

"It will be exciting to see what comes out of bringing together so many distinguished scholars from diverse disciplines to discuss our topic," says Murray. ■



Linguistic map of North America

(Image: Ishwar, Wikimedia Commons)

### 2010 Trustees, Business Network symposium to explore regulation

Regulation – the rules, constraints, limits, controls, tolerances, and preferences that keep life in balance – is a key component of most complex systems.

Financial markets, for example, are regulated not only by formal rules such as business and tax laws, but also by implicit constraints such as the analyses, opinions, and moods of traders

and major economic, social, and political events. Similarly, an ecosystem is regulated by a balance between the number of predators and prey.

SFI's 2010 Business Network and Trustees Symposium November 11-13 will explore the roles of regulation in systems as diverse as the economy, the Internet, health care, biomedicine, space, biology, and international affairs.

"There is a great deal to learn from a truly comparative, transdisciplinary approach to regulation," says SFI VP for Administration Chris Wood, who leads the Business Network. "We want to explore the concepts, methods, and possible generalities of regulatory mechanisms in a range of systems in which regulation is important.

More at [www.santafe.edu](http://www.santafe.edu) ■



## SFI IN THE NEWS

The early time course of compensatory face processing in congenital prosopagnosia; Stollhoff, R.; **Jürgen Jost**; Elze, T.; Kennerknecht, I.; *PLOS One* 5 (7), July 21, 2010

Correlation, hierarchies, and networks in financial markets; Tumminello, M.; **Fabrizio Lillo**; Mantegna, R.N.; *Journal of Economic Behavior & Organization* 75 (1 SP ISS), July 2010

Absence of xenotropic murine leukemia virus-related virus in blood cells of men at risk for and infected with HIV; Kunstman, K.J.; **Tanmoy Bhattacharya**; Flaherty, J.; Phair, J.P.; Wolinsky, S.M.; *AIDS* 24 (11) July 2010

Network design meets in silico evolutionary biology; Rodrigo, G.; Carrera, J.; **Santiago Elena**; *Biochimie* 92 (7), July 2010

Universality of Zipf's law; Corominas-Murtra, B.; **Ricard Solé**; *Physical Review E* 82, July 1, 2010

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The May-June *IAVI Report* features the work of SFI External Professor Bette Korber and her Los Alamos National Lab team to track and record the evolution of the HIV virus and compile a database that serves as a foundation for worldwide research on HIV.

*The Economist* and CNBC covered remarks by SFI Professor Doyne Farmer at the 2010 Techonomy conference in July that during recent financial crises Congress has had to act without reliable information, and that a better approach is needed.

*The Economist* and *Newsweek* reviews a recent NSF-sponsored workshop organized by SFI

Professor Doyne Farmer and External Professor Rob Axtell, who called for a new economic models, built from the behaviors of individual agents, that might help economists foresee future financial crises.

*New Scientist* on July 27 features the career and current interests of SFI's most recognized scientist, Distinguished Professor and Nobel laureate Murray Gell-Mann.

*New Scientist* on August 3 reviewed research on the mathematics of asymmetric warfare, including recent work by former SFI Omidyar Fellow Aaron Clauset to understand terrorism.

In the August 8 *Chronicle of Higher Education*, SFI External Professor Simon Levin reviews the integrative, interdisciplinary history of the science of ecology and calls for its further integration with the social sciences, the humanities, and public policy.

NASDAQ.com and the *Wall Street Journal* blog Real Time Economics covered a paper released August 12 by the Federal Reserve Bank of New York by Yale economist and SFI External Professor John Geanakoplos, who concludes that in moments of financial crisis, central banks should lend at more generous terms than the market.

*Science News*, *Wired.com*, and *Popular Science* covered research led by SFI Miller Scholar and External Professor Seth Lloyd (MIT) to analyze how inconsistencies in the theories of time travel might play out in real-life time travel.

Forbes.com on August 26 features SFI External Professor Joshua Epstein and his agent-based modeling of disease outbreaks and mentions his collaborative work with External Professor Rob Axtell.

## INSIDE SFI

# Economic uncertainty prompts cutbacks

2010 has been another tough year: for the economy, for government sponsors, for donors, for nonprofits everywhere, and, not surprisingly, for SFI.



SFI President Jerry Sabloff says although the Institute's science is increasingly vibrant and important, the Institute's budget is, at least for 2010, problematic. In late July, following a line-by-line review of expected revenue and expenditures,

Jerry announced to SFI's researchers and staff a series of measures intended to make balancing the budget for 2010 more achievable.

Two shifts occurred that prompted the cutbacks.

First, a number of SFI donors either lowered their giving amounts or, because of the economic uncertainty, adopted a wait-and-see approach before making their planned gifts for 2010. Although many of these donors might still give toward the end of the year, SFI cannot count on this revenue, he says.

Second, the amount of grant revenue coming in to SFI is less than expected; although the total number of new grants has risen, he says, the amount of funding per grant is down significantly.

As a result, at the end of July SFI needed to raise about \$1.6 million in new revenue by the end of the year, an amount Jerry and the Trustees thought was not feasible given the economic climate.

"The time left for us to succeed in our fundraising before year end had become too small for comfort," he says. "We had to undertake an unfortunate, but wise, approach of aggressive cost cutting across all segments of SFI."

The cutbacks, effective August 1, included:

- Salary reductions (graded by salary level) of 5, 7.5, or 10 percent for all SFI researchers and staff for the remainder of the year
- Temporary suspension of SFI pension contributions
- Temporary freeze on hiring
- Temporary freeze on new commitments for workshops, working groups, and visitors
- Belt tightening in all programs and operations

These measures save SFI approximately \$850,000, says Jerry. As of September 1, additional savings and new gifts had lowered to about \$312,000 the revenue-to-be-raised figure (new revenue not already built into the budget).

"Throughout this process we have worked very hard to minimize the effects on our scientific and educational programs," he says.

Looking toward 2011, he says, SFI's leadership team is carefully rethinking the Institute's business model and is putting a host of ideas on the table to see which ones might result in new, responsible revenue streams without changing the Institute's character.

"We have a bunch of ideas in the early stages," he says. "Our goals are to keep SFI's science vibrant while evolving toward a model that is more reliable and sustainable. There are more changes to come." ■

complex, and audience members must never respond with the instinctual "yeah, but"; instead, "yes, and" is the preferred interjection.

"It's easy to sit in an office and solve problems exactly the way the field does it," says Simon, "or to sit in the back row and throw spitballs while a colleague gives a talk. But it's just as important to explore ideas that aren't very well fleshed out."

SFI has entertained six Reckless Ideas since March. David, for example, posited reasons development is important for an organism. Miller Scholar Daniel Dennett introduced the notion of "selfish" neurons. Omidyar Fellow Jeremy Van Cleve discussed phenomena in social organisms that might appear "telepathic."

"Reckless Ideas helps us remember that, just like us, our colleagues don't have a direct line to the truth," says Simon. ■

## > Templeton partnership continued from page 1

Target areas within the Foundation's science of complexity program include neurocomplexity, complex systems in economics and the social sciences, and genetic and quantum mechanical aspects of the origins of life.

The Foundation also is interested in "new perspectives, methods, and tools that might enrich scientific and popular understandings of complexity, especially new ways of representing and visually depicting complex processes," according to the Foundation's call for inquiries.

SFI will focus exclusively on mathematics and the natural sciences and views its role as ensuring that the highest quality inquiries describing rigorous, empirically grounded science are invited to



Hands from Michelangelo's "Creation of Adam" superimposed on a NASA composite image of the Orion nebula.

submit full proposals, says SFI President Jerry Sabloff.

*"SFI views its role as ensuring that the highest quality inquiries describing rigorous, empirically grounded science are invited to submit full proposals."*

Specifically, SFI will concern itself with how evolution and self-organization give rise to complexity in living systems, how macro-scale phenomena emerge from micro-scale processes, and ways to measure and represent complexity, he says.

SFI will not evaluate the portions of inquiries or proposals that address "philosophical and theological reflection on divine creativity and providence," which the Foundation will evaluate directly.

"We are excited to be playing a role in helping direct such an important source of funding to projects that we consider of great scientific merit," says Jerry. "The Foundation has shown considerable vision in supporting this important area of science, and we look forward to seeing the research that it promotes." ■

## INSIDE SFI

# Reckless ideas: 'All things provisional, questionable, and wildly long-leap'

On certain summer afternoons at SFI, a brave researcher unleashes a stray thought, a wild hunch, an untested notion yearning to breathe free. Right in front of some of the smartest people in a handful of scientific fields, who then weigh its merits.

It can be a harrowing experience, says Omidyar Fellow Simon DeDeo, organizer of SFI's every-three-weeks-or-so "Reckless Ideas," also known as "Blue Sky Seminars" – the latter looks better on your CV, he says.

Billed as "all things provisional, questionable, and wildly long-leap," Reckless Ideas was started by Faculty Chair David Krakauer as a way to leverage the Institute's interdisciplinary environment in a forum more formal than banter over lunch and less so than a presentation.

Two rules apply: Presenters may use no more than one slide to present an idea, no matter how

## 2010 Ulam Lectures: Why networks matter

Networks are everywhere: the Internet, roads, our social connections, even the chemical interactions that power the cells in our bodies. The science of networks, a field that has come of age in the last decade, is illuminating never-before-seen relationships and patterns all around us.

In this year's SFI Ulam Lecture series – themed "Our Small World: How Networks of People and Information Shape Our World" – SFI External Professor Mark Newman described the new insights network science offers in three lectures over three nights.

- Tuesday, September 14, "The Connected World"
- Wednesday, September 15, "What Networks Can Tell Us About the World"

- Thursday, September 16, "Using Networks To Make Predictions"

Mark, a member of SFI's Science Board, is a professor of physics and complex systems at the University of Michigan. He has studied networks in fields ranging from sociology and economics to computer science and biology, contributed to the fundamental understanding of network science, and made computer models of many networks. His most recent book, *Networks: An Introduction*, is profiled on page 4.

SFI's Ulam Lecture series is named for Polish mathematician and Manhattan Project contributor Stanislaw Ulam (1909-1984). SFI Public Lectures are free and open to the public. They are supported in part by funding from Los Alamos National Bank. ■



## Upcoming Public Lecture

**Wednesday, October 13, 7:30 p.m., "The Penguin and the Leviathan: The Science and Practice of Cooperation"** – Harvard professor of entrepreneurial legal studies and business author Yochai Benkler casts dispersions on the centuries-old practice of managing people through incentive structures – both rewards and punishment – based on an assumption of individual selfishness. He will review examples of successful institutions that have turned to human cooperation rather than behavior modification to achieve their desired

ends. He shows how recent work in human behavioral and brain sciences and in evolutionary theory is helping us better understand how and why these systems work. Benkler is the Berkman Professor of Entrepreneurial Legal Studies at Harvard and faculty co-director of the Berkman Center for Internet and Society. The lecture, at the James A. Little Theater, is underwritten by Los Alamos National Bank and Penelope Penland [see profile on page 4]. Admission is free, but seating is limited. ■





## A mammal is a mammal is a mammal



(Image: Idizimage, istockphoto.com)

Despite 100 million years of evolutionary divergence, people, platypuses, and kangaroos all allocate the same proportional amount of energy to reproduction and offspring development, according to a recent study in *Proceedings of the Royal Society B-Biological Sciences*.

"This is more evidence that fundamental metabolic constraints underlie the development of wildly different mammals on different branches of the tree of life," says SFI Postdoctoral Fellow Marcus Hamilton, the paper's lead author.

The researchers compared data from three lineages of mammals: placentals (wombed mammals), marsupials (pouched mammals), and monotremes (egg-laying mammals).

Historically these groups diversified rapidly on different land masses as the supercontinent Pangaea fragmented and drifted apart – and each evolved conspicuously distinct reproductive and lifespan energy-tradeoff strategies.

Marsupials, for example, are born sooner at a smaller size and are nurtured in the pouch. Placentals are born later and larger and are nourished longer by lactation until they become independent.

The researchers find that despite their very different life histories and reproductive physiologies, all three groups of mammals produce new

body mass at an equivalent and predictable rate. Their work supports the belief among a growing number of scientists that many properties of living things, such as life spans, growth rates, and reproductive capacities, change in predictable ways with organisms' body sizes – a phenomenon known as allometric scaling.

Such scaling theories, based in part on past work by SFI External Professor Jim Brown, Distinguished Professor Geoffrey West, and External Professor Brian Enquist, point to constraints imposed by a mammal's metabolic processes. Essentially, the bigger the organism, the more slowly its transport networks (such as blood vessels) deliver resources to cells. Based on the size of the organism, resources can be delivered to cells efficiently but only so efficiently.

"Metabolic processes underlie the fundamental characteristics of mammalian life, and [our findings add support to the notion that metabolism is to ecology as genetics is to evolution]," Hamilton says. "In essence, placentals, marsupials, and monotremes are simply evolutionarily equivalent ways of being a mammal."

The paper's co-authors are Ana Davidson of the Universidad Nacional Autonoma de Mexico, Richard Sibly at the University of Reading, and Jim Brown, SFI and the University of New Mexico. ■

## Q&A with Dr. Penelope Penland

Dr. Penelope Penland says her approach to her own work as a licensed psychologist trained in systems theory has become more reflective of complex issues since her association with the Institute. Ideas from SFI have informed her specializations – the psychology of money, philanthropy in particular, and estate planning.

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

**Penelope:** I started attending SFI public lectures in 1991 and, one particular evening, an Institute person – Susan Bellotti perhaps – made a request to the audience for financial underwriting for the series. Frankly, it had never occurred to me that support was needed. I thought it was very generous of SFI to offer these wonderful lectures to all of us for free, and I was motivated to respond. I've underwritten at least one lecture every year since then, and it has been tremendously rewarding.

I particularly like to choose a topic that I find more related to my field of psychology. That's why I'm sponsoring "The Penguin and the Leviathan" about the science of cooperation on October 13 [see page 3]. I think it's wise to let people know clearly when you need help and to help them find a place they can relate. They just might enjoy stepping up for something meaningful.



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

**Penelope:** SFI is coming up with better, more nuanced ways of looking at and understanding life and the world around me. I enjoy moving toward science – and different paradigms – and then taking ideas back to my chosen field of psychology to see how the different perspectives complement and illuminate each other. ■

### INSIDE SFI

## Exhibit: A fresh look at life's origins

The New Mexico Museum of Natural History & Science in Albuquerque will soon have a new, permanent exhibit that takes a fresh look at the origins of life.

The National Science Foundation has awarded an SFI team, led by Science Board member Harold Morowitz and Professor D. Eric Smith, a grant of \$162,822 to develop the exhibit, scheduled to open at the museum in May 2011. It will replace the museum's current origins of life exhibit, now 25 years old.

Collaborating institutions include the Institute of Complex Adaptive Matter, New Mexico

Highlands University, Americorps, the Museum, and the New Mexico Department of Cultural Affairs.

"Emergence: A New View of Life's Origins" will cover recent discoveries relating to the origins of life from biology, chemistry, and geology that have emerged from the recent use of improved mathematical techniques, modeling and simulation, and computer science. It will cover the formation and geologic history of Earth, early life forms, inorganic and organic chemical pathways, as well as DNA, RNA, proteins, and other biological structures. ■

### INSIDE SFI

## Music-science event to explore planets

For the second year, SFI and the Santa Fe Symphony Orchestra are collaborating to produce a unique event exploring the interface between science and music.

*Voyages of Discovery: The Planets*, will feature the works of Claude Debussy (*Nocturnes*) and Gustav Holst (*The Planets*) and projection images of the solar system by Dr. Jose Francisco Salgado of Chicago's Adler Planetarium.

The music will be interspersed with commentary by Salgado and SFI Omidyar Fellow Simon DeDeo, who will discuss exoplanets.

The concert is October 31 at 4:00 p.m. at the Lencic Performing Arts Center in Santa Fe.

A cocktail buffet reception will follow, at the Eldorado Hotel.

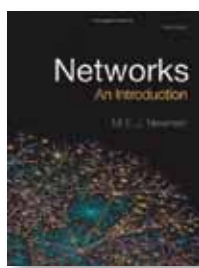
On October 30 at 4:00 p.m., the symphony will perform a one-hour version of the event just for children and families, called *Voyages of Discovery: Family Adventure*.

Tickets for the concerts and the reception are available at the Symphony box office, at [www.santafesymphony.org](http://www.santafesymphony.org), or at (505) 983-1414.

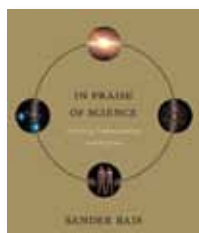
The concerts are underwritten by the Ralph B. Rogers Foundation, and the reception by SFI Trustee Diana MacArthur. ■

### BOOK NEWS

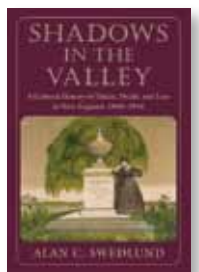
## Networks, science, disease, & depopulation



*Networks: An Introduction*, by SFI External Professor Mark Newman (Oxford University Press, April 2010, 720 pages), highlights the most important breakthroughs in network science from math, physics, computer and information sciences, biology, and the social sciences.



*In Praise of Science: Curiosity, Understanding, and Progress* (MIT Press, March 2010, 192 pages), SFI External Professor Sander Bais reveals the connectivity of the natural sciences, explores what makes scientists tick, seeks to bridge the gaps between culture and science, and reviews science's impact on the human condition.

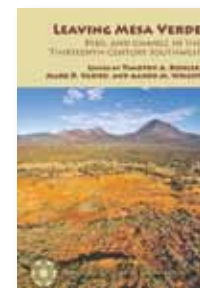


*In Shadows in the Valley: A Cultural History of Illness, Death, and Loss in New England, 1840-1916* (University of Massachusetts Press, April 2010, 272 pages), SFI External Professor Alan Swedlund examines the history of mortality in western Mas-

sachusetts from the advent of the germ theory of disease through U.S. public health reform and the rise of modern medicine.



A book co-authored by Alan Swedlund, *Plagues and Epidemics: Infected Spaces Past and Present* (Berg Publishers, April 2010, 416 pages), presents views from anthropology about past epidemics, assesses today's public health institutions, speculates about future outbreaks, and explores new ways of understanding them.



In a new book co-edited by SFI External Professor Tim Kohler, *Leaving Mesa Verde: Peril and Change in the Thirteenth-Century Southwest* (University of Arizona Press, July 28, 2010, 464 pages), 15 scientists make use of new paleo-environmental and archaeological data and modeling to retell the story of climate change, environmental degradation, social rigidity, conflict, and disruption leading to the depopulation of the American Southwest in the 1200s. ■

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