

UPDATE



September 2005

SANTA FE INSTITUTE

INSIDE SFI: ON AND OFF THE COWAN CAMPUS

THE TWELFTH ANNUAL STANISLAW ULAM MEMORIAL LECTURE SERIES

SEPTEMBER 20-22, 2005

Held at the James A. Little Theater located at the
New Mexico School for the Deaf
7:30-8:30 pm each evening

Marcus W. Feldman, *Board of Trustees, Science Board,
Santa Fe Institute; Burnet C. and Mildred Finley Wohlford
Professor of Biological Sciences; Director, Morrison Institute
for Population and Resource Studies, Stanford University*

*Molecules, Machines, and Mathematics:
Issues in Biological and Social Evolutionary Theory*

The lectures begin with a description of what the various genome projects have shown about the patterns of genomic variation in modern humans. Advances in computational and mathematical analyses have helped to formulate what will be described as the standard theory for the evolution of modern humans. For some populations, recent history and genetic patterns have an extremely interesting concordance.

For biological evolution, in many cases it is incorrect to view organisms as evolving "to solve a problem." Following a suggestion by Richard Lewontin, a new framework has been developed for biological evolution that replaces the notion of adaptation with one of niche construction, according to which there is symmetry between organism and environment, with feedbacks between these forming the driving force of evolution. For cultural evolution, a similar framework can be developed with some culturally transmitted

traits forming a "cultural" environment that permits or prevents other social or indeed biological changes from occurring. Dr. Feldman will present an important example from the epidemiology of infectious disease in the presence of antibiotic therapies.

Lecture I: On average, any two humans differ in about 0.1% of their DNA. This talk will describe how this variation is studied to make inferences about human ancestry, human migrations, and the potential for "race-based" medicine. The meaning of continental ancestry will be explained, as well as why this should replace "race" in the literature on human variation.

Lecture II: For the past 2500 years at least, Chinese families have had a preference for sons. During the high fertility epoch of the Twentieth century this preference had little demographic impact. The past 20 years of limited fertility have produced a severely male-biased sex ratio. Marriage customs and social security norms exacerbate this problem. Using the theory of cultural evolution we can predict the consequences of the bias towards males and test ideas about how the bias might be mitigated in contemporary China.

Lecture III: Classical biological evolution regards the environment as a problem to be solved by organisms through their genes. Niche construction introduces symmetry between the evolution of the environment and that of organisms. This idea can be extended to social evolution where specific behaviors and the norms that underlie them co-evolve. Anthropological examples will be discussed as well as the relationship between education and fertility reduction, and the case of antibiotic resistance in bacteria. Computer simulations and mathematical formalism suggest important leverage points in these analyses.

SHUBIK RECEIVES AWARD

Professor and SFI External Faculty member, **Martin Shubik** (Yale University), recently received the Lifetime

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Contribution Award from the International Simulation and Gaming Society (ISAGA).

ISAGA is an international organization for scientists and practitioners developing and using simulation, gaming, and related methodologies. They include: simulation, gaming, role-play, structured experiences, policy exercises, computerized simulation, play, virtual reality, game theory, debriefing, experiential learning, and active learning.

PAPER ACCEPTED

The paper "Asymptotically Scale-Invariant Occupancy of Phase Space Makes the Entropy S_q Extensive," by **C. Tsallis, M. Gell-Mann,** and **Y. Sato** has been accepted for publication in *PNAS*.

In addition to the analysis of the thermodynamically desirable extensivity of S_q , it contains the first proposal of analytical connection between the elements of the q -triplet. The existence of such a triplet was predicted in 2004, and it was recently detected and determined, in the solar wind, by NASA researchers L. F. Burlaga and A. F. Vinas ("Triangle for the entropic index q of non-extensive statistical mechanics observed by Voyager 1 in the distant heliosphere." *Physica A* (2005): 356, 375.

Constantino was a Plenary Lecturer at the "News, Expectations and Trends in Statistical Physics" conference in Crete, Greece, August 13-18, 2005, where he presented these results.

SFI WELCOMES POSTDOCTORAL FELLOW CHEN HOU

Dr. Chen Hou began an SFI postdoctoral fellowship in August. Dr. Hou received a Ph.D. in Physics, 2005, and an M.S. in Physics, 2000, from the University of Missouri at Columbia. He completed a B.S. in Physics in 1997 from Sichuan University, Sichuan, P. R. China.

While in residence at SFI, he plans to work with SFI President and Distinguished Research Professor Geoffrey West.

BUSINESS NETWORK NEWS

NEW MEMBERS TO BUSINESS NETWORK

Hewlett-Packard (HP) whose history spans more than six decades of innovation is a technology solutions provider to consumers, businesses, and institutions globally. The company's offerings span IT infrastructure, global services, business and home computing, and imaging and printing. More information about HP is available at <http://www.hp.com>.

Eric Beinhocker is a recognized authority on strategy, economics, and complex adaptive systems theory. Mr. Beinhocker is the author of numerous articles, and several Harvard Business School case studies. Most recently, he served as the Executive Director of Europe with The Corporate Executive Board (currently retired), and as a former partner at McKinsey & Company and a Senior Advisor to McKinsey's Global Strategy Practice, has joined the Business Network. His membership will be listed on the roster as **Beinhocker**.

UPCOMING EVENTS

COMPLEXITY—FROM THEORY TO PRACTICE

SEPTEMBER 15-16, 2005, SANTA CLARA, CA

The Santa Fe Institute will host a two-day overview of complex adaptive systems, September 15-16, 2005, at the Santa Clara Convention Center in Santa Clara, California. This two-day colloquium will feature in-depth presentations (2-3 hours each) by scientists including: **Murray Gell-Mann, Geoffrey West,** and **Scott Page**. A roundtable discussion will include **Bill Miller, Graham Spencer,** and **James Surowiecki**. Attendance is open to all who are interested. For additional information and registration please visit the official website at <http://www.santafe.edu/complex05> or contact **Ann Stagg** at annstagg@santafe.edu.

ADAPTIVE AND RESILIENT COMPUTING SECURITY (ARCS) WORKSHOP

NOVEMBER 2-3, 2005, SANTA FE, NM

ARCS 2005 is the fourth annual workshop designed to bring together senior industrial researchers, policy makers, and leading academics in the area of adaptive approaches to computer security. There will be two days of presentations and discussions, sponsored by British Telecom and Santa Fe Institute. Please visit the workshop website at <http://www.arcs-workshop.org>.

SANTA FE INSTITUTE ANNUAL BUSINESS NETWORK MEETING AND FALL TRUSTEES' SYMPOSIUM

NOVEMBER 4-5, 2005, SANTA FE, NM

Our yearly gathering of Business Network members, trustees, researchers, and staff will take place in Santa Fe at the Hilton Hotel. For more information please contact Ann Stagg. Attendance is by invitation only. An online registration form will be posted on our website soon.

NOTES FROM THE INTERNATIONAL PROGRAM

SUMMER SCHOOL IN BEIJING

The Complex Systems Summer School held in Beijing, China, concluded with a poster session and final banquet on August 5, 2005. Approximately 30 Chinese students and 30 students from Europe and North America attended the four weeks of lectures and seminars. The school will be held again next summer in Beijing with the support of the Chinese Academy of Sciences.

INTERNATIONAL FELLOW VISITS SFI

Gabriela Barrantes (SFI International Fellow) of the Universidad de Costa Rica returned to SFI to

collaborate with Stephanie Forrest. Gabriela is an associate professor and works with Stephanie on applying ideas from biological diversity and immunity to computer security issues.

LIBRARY ACQUISITIONS

For a list of recent purchases by the SFI library, please see <http://www.santafe.edu/events/update/library.php>

PUBLICATIONS

<http://www.santafe.edu/events/update/publications.php>

SFI BOOK TO APPEAR IN PRINT

We are pleased to announce that our 51st book in the Santa Fe Institute "Studies in the Sciences of Complexity" series should appear in print this month. *The Economy as an Evolving Complex System III: Current Perspectives and Future Directions*, was edited by **Lawrence E. Blume** (SFI External Faculty member) and **Steven N. Durlauf** (SFI Science Board member). Derived from a 2001 Santa Fe Institute Conference, this book represents scholarship from the leading figures in the area of economics and complexity. The subject, a perennial centerpiece of the SFI program of studies, has gained a wide range of followers for its methods of employing empirical evidence in the development of analytical economic theories. Accordingly, the chapters in this volume address a wide variety of issues in the fields of economics and complexity, accessing eclectic techniques from many disciplines. Dedicated to Kenneth Arrow on his 80th birthday, this volume honors his many contributions to the Institute. SFI-style economics is regarded as having had an important impact by introducing a new approach to economic analysis.

The book can be purchased from the OUP website at <http://www.us.oup.com/>

SFI WORKING PAPERS

<http://www.santafe.edu/research/publications/working-papers.php>

05-08-035

"Equilibrium Selection by Intentional Idiosyncratic Play"

Suresh Naidu and Samuel Bowles

05-08-034

"A Generative Model for Feedback Networks"

Douglas R. White, Natasa Kejzar, Constantino Tsallis, J. Doyne Farmer, and Scott D. White

05-08-033

"The Thermodynamic Dual Structure of Linear-Dissipative Driven Systems"

D. Eric Smith

05-07-032

"Dates and Rates: Temporal Resolution in the Deep Time Stratigraphic Record"

Douglas H. Erwin

05-07-031

"Directed Discovery of Novel Drug Cocktails"

John H. Miller, Ralph Zinner, and Brittany Barrett

REFEREED LITERATURE

<http://www.santafe.edu/events/update/publications.php>

Flack, J. C., D. C. Krakauer, and F. B. M. de Waal.

"Robustness Mechanisms in Primate Societies: A Perturbation Study." *Proc. Roy. Soc. Lond. B Biol. Sci.* 272(1568) (2005): 1091-1099.

Lillo, F., and R. N. Mantegna. "Spectral Density of the Correlation Matrix of Factor Models: A Random Matrix Theory Approach." *Phys. Rev. E* 72(1 PT 2). (2005): 470-479.

Pourbohloul, B., L. A. Meyers, D. M. Skowronski, M. Kraiden, D. M. Patrick, and R. C. Brunham.

"Modeling Control Strategies of Respiratory Pathogens." *Emerging Infectious Diseases* 11(8) (2005): 1249-1256.

Stocsits, R. R., I. L. Hofacker, C. Fried, and P. F. Stadler. "Multiple Sequence Alignments of Partially Coding Nucleic Acid Sequences." *BMC Bioinform.* 6(160) (2005): 1-8.

Frahm, N., S. Adams, P. Kiepiela, C. H. Linde, H. S. Hewitt, M. Lichterfeld, K. Sango, N. V. Brown, E. Pae, A. G. Wurcel, M. Altfeld, M. E. Feeney, T. M. Allen, T. Roach, M. A. St. John, E. S. Daar, E. Rosenberg, B. Korber, F. Marincola, B. D. Walker, P. J. R. Goulder, and C. Brander. "HLA-B63 Presents HLA-B57/B58-Restricted Cytotoxic T-Lymphocyte Epitopes and is Associated with Low Human Immunodeficiency Virus Load." *J. Virol.* 79(16) (2005): 10218-10225.

CALENDAR OF EVENTS

<http://www.santafe.edu/events/calendar.php>

September 15-16

Workshop: A General View of Complex Adaptive Systems

Organized by Susan Ballati (SFI) and Ann Stagg (SFI)

September 16-18

Workshop: General Patterns of Migration

Organized by Ilia Peiros (SFI), Peter Peregrine (Lawrence University), and Sergei Starostin (Russian Academy of Sciences and SFI)

SEPTEMBER VISITORS AND ARRIVALS

<http://www.santafe.edu/events/monthlyvisitors.php>

Tim Kohler (9/1-21), Washington State University

Joshua Ladau (9/30-9/2006), Cornell University

Beáta Oborny (9/15-10/30), Eötvös Loránd University

Thimo Rohlf (9/23-10/1), Max-Planck Institute for Mathematics in the Sciences

Sergei Starostin (9/10-11/10), Russian Academy of Sciences and Santa Fe Institute

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