Society for Chaos Theory in Psychology & Life Sciences

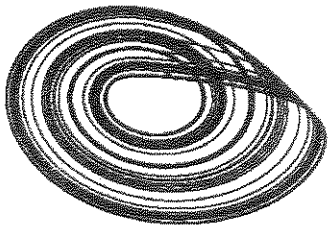
NEWSLETTER

Vol. 17, No. 1
April 2010

CONTENTS THIS ISSUE

President, DICK THOMPSON
Editor, SARA NORA ROSS
Production, STEPHEN GUASTELLO
Send Newsletter submissions to:
Sara.Nora.Ross@gmail.com

Cover photo by Michael Radin



Beat the April 30 Deadline

SCTPLS CALL FOR ABSTRACTS

For the 20th Annual International Conference

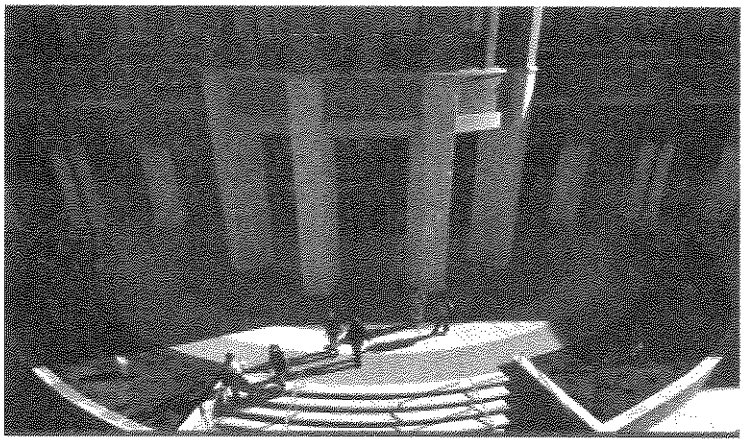
Texas State University, San Marcos, TX USA July 22-24, 2010

We invite interested scholars to present and discuss recent developments in nonlinear dynamical system theory, which includes chaos theory, fractals, complex systems and related topics. Over the years, the annual conferences of the Society for Chaos Theory in Psychology & Life Sciences have inspired and supported scholars from an array of disciplines look at new ways to develop their theoretical and empirical work in an integrated approach to life sciences.

The program will include workshops, three invited speakers, symposia, panel discussions, a poster session, and sessions of individual papers. Advances in basic or applied research, developments in theory, reports of empirical results and methodological papers are all welcome. We continue to encourage all nonlinear scientists, including graduate students who might be finishing up a dynamical thesis or dissertation, to consider sharing their ideas through paper presentations, chairing a roundtable session, or by proposing other alternative presentation formats, such as posters, product demonstrations, short workshops, or debates around controversial topics.

Instructions for Abstracts

Abstracts should be between 150-250 words for posters, individual papers, short workshops and other alternative formats. The connection to nonlinear dynamics, chaos, complexity, fractals or related concepts should be clear to the reader. Include organizational affiliation and contact information on each speaker or author.

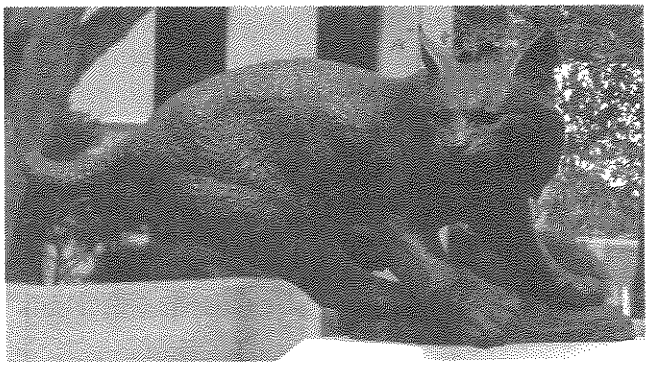


Abstracts may be up to 500 words for symposia or panel discussion. For symposia, abstracts should reflect the content of EACH speaker's contribution. The format for a symposium is for all speakers to give presentations, followed by or interspersed with discussion. Symposia should present current research within a coherent theme defined by the title and abstract.

For experimental work, the background, aims and framework, methods and samples, results, conclusions and Implications should be clear to the reader. For theoretical work, the background, aims and framework, mode of inquiry, outcomes, conclusions and implications should be clear to the reader.

Abstracts for panel discussions should provide a brief overview of the topic, and indicate the relevant background of the panelist and sample questions they will address. The format for a panel discussion is an introduction to the topic and the speakers, after which the panelists address as series of questions or issues (rather than just giving a series of presentations).

Abstracts for workshops should present state-of-the-art information on techniques useful for conducting research or applications of nonlinear science in the behavioral, social and life sciences. They should be pedagogical in nature. Where applicable, the abstract should emphasize skills that attendees can expect to acquire.



The bronze Bobcat statue at TSU was created by noted sculptor Matthew Palmer of Friday Harbor, Washington. Photo and text source: http://www.txstate.edu/virtual-campus-tour/tour-stops/bcat-statue.html

For all abstracts: The connection to nonlinear dynamics, chaos, complexity, fractals or related concepts should be clear to the reader. Please stress what is the overall value added to the field (e.g. new method, new information, new perspective or issue, valuable confirmation of the present knowledge, adds clarity to present understanding). Each person submitting is limited to a maximum of two presentations as first author. It is acceptable to be a co-author on additional work submitted by others.

The deadline for submissions is April 30, 2010. Abstract should be submitted electronically by visiting: http://www.societyforchaostheory.org/conf/2010/cfp.html

Our meetings will be held at the inspiring facilities of Texas State University, San Marcos, TX USA. San Marcos is close to Austin TX and uses its airport. We will meet in the Agricultural Sciences Building and Hines Academic Center, next to each other and just across the street from a large university parking lot. We will announce the exact rooms when the info is available. Participants will use hotels close to the campus for lodging.

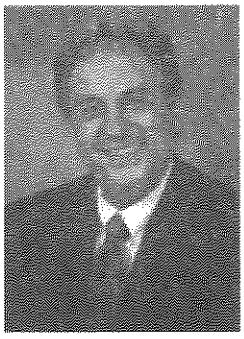
Your SCTPLS 2010 Conference Committee: Dick Thompson, High Performance Systems | A. Steven Dietz, Texas State University | Constance Porter, St. Edwards University | Stephen J. Guastello, Marquette University | Sara Nora Ross, Antioch University McGregor and ARINA, Inc.

We hope to see  ***you in San Marcos!***

Newly Announced: Philip Salem is Third Featured Guest Speaker

Philip Salem – Special Speaker

Finding the Sweet Spot in Human Communication



The dynamic tension in all living systems is between similarity and difference. There are many sets of polarized terms representing this tension, but chaos and complexity scholars recognized this tension as amounts of information. Information represents the amount of relative variety – a mix of similarity and difference, and when the amounts were high, but not too high, the system moved to transformation – to the edge of chaos, to the complexity regime, to strange attractors, or to chaos, depending on the model. The sweet spot is that range of relative variety, just the proper mix of similarity and difference, leading to transformation.

Human communication is an emergent social process. It occurs when individuals in a social relationship create messages cueing each other as part of an ongoing episode. Human communication is an effort to make sense of an episode created by the process itself. The process constitutes our social and psychological life together.

This paper explores the dynamic tension in communication constituting three phenomena: (a) self, (b) trust in immediate and extended relationships such as social networks, and (c) organizations. In each case I will describe current literature highlighting tensions between similarity and difference, and I will explore the potential to move from one basin of attraction to another. The primary constraints on modeling communication transformations are discovering the appropriate parameters and bracketing sequences to define initial conditions, constraints common to modeling all nonlinear processes.

Dr. Salem has just completed The Complexity of Human Communication (2009), a book describing the process and evolving nature of communication. He recently edited Organizational Communication and Change, a collection of papers from scholars attending conferences he directed

in 1976 and in 1996. Dr. Salem has received awards for his work about communication and technology and is known for his work in educational administration, including Organizational Communication in Higher Education, published by AAHE. He directed a project funded by the Department of Education to develop a theory of organizational factors influencing the incorporation of new units into an organization. His consultant work focuses on organizational communication development and routinely assists clients in assessing and planning organizational communication.

Dr. Salem has delivered lectures and taught at several universities around the world. He recently taught two courses at the university of Vienna, and he spent part of last summer lecturing, training, and consulting at the Institute for Management, Business, and the Law at Rostov-on-the-Don, Russia. He was awarded a Fulbright Senior Specialist fellowship for 2007-2012.

He came to Texas State University in 1974, and is in the Department of Communication Studies. He lives in Austin with his wife, Cookie, and three dogs. He has one daughter, two sons and six grandchildren. B.S. Ed., Northern State University, M.A. University of Denver, Ph.D., University of Denver.

Our other special guest speakers. As announced in the January newsletter, Kevin J. Dooley will be our Sunset Session Speaker. Robert Goldstone is our Banquet Keynote. Their abstracts follow.

Kevin J. Dooley - The Weed Organization: A Survival Guide for Businesses the Day after Tomorrow

As if managing a business wasn't complex enough already, the business environment in the future is likely to be more volatile because of resource shortages and changes to our physical and social environments. This talk examines the current state and the future of business and sustainability through the lens of complexity science. First, I shall describe how Wal-Mart in concert with other retailers and manufacturers is using a complexity-like approach to create a sustainable product index for all consumer goods. Second, I shall predict what may happen to businesses at the "transition" between Consumerism 1.0 and 2.0, using far-from-equilibrium concepts. Third, I shall introduce the concept of the Weed Organization, a super-adaptive form of organizing that may come to dominate the future business landscape.

Robert Goldstone - The Group Consequences of Individual Strategies for Imitation and Innovation.

Just as ants interact to form elaborate colonies and neurons interact to create structured thought, groups of people interact to create emergent organizations that the individuals may not understand or even perceive. To study the emergence of group behavior patterns, we have developed an internet-based experimental platform (for examples, see http://groups.psych.indiana.edu/) that allows groups of 2-200 people to interact with each other in real time on networked computers.

Using these technologies, I will describe experiments on how innovations are propagated within a group. One series of experiments explores how people attempt to solve simple problems while taking advantage of the developing solutions of other people in their social network. The results suggest that complete information is not always beneficial for a group, and that problem spaces requiring substantial exploration benefit from networks with mostly locally connected individuals.

In a second line of experiments, we study the dissemination of innovations in a networked group for a multi-dimensional search problem with many local minima. We find evidence for several strategies that determine imitation and innovation decisions based on: similarity, choice popularity, timing, and success.

In a third, real-world application area, I consider historical data on how U.S. parents name their children. We find that naming choices are influenced by both the frequency of a name in the general population, and by its "momentum" in the recent past in the sense that names which are growing in popularity are preferentially chosen. This momentum bias has itself been increasing over the course of 130 years. For each of these areas, I will describe agent-based modeling efforts at explaining empirically observed patterns of exploration and exploitation, bandwagon effects, population waves, and compromises between individuals using their own information and information obtained from their peers.

Register for our Dynamic Pre-conference Workshops!

Four New, Exciting Pre-Conference Workshops!

These lively, half-day workshops are designed to teach useful skills and methods. Designed to meet learning objectives, they are great conference take-aways!

***Jeffrey Goldstein* – Complexity Science and Social Entrepreneurship within the Context of Social Innovation**

The burgeoning arena of social entrepreneurship within the context of social innovation is one example of how public and private organizations can forge alliances to address the unique and pressing challenges facing both the domestic and global economic and social environments of the 21st century. However, at present, there is no recognizable theoretical underpinning to describe the systemic dimensions of the phenomenon in ways that can help those who are engaged in the field, theoretically and practically, to succeed. In this workshop we will look at how the sciences of complex systems offer promise in providing a more thorough understanding and grounding for the field. We will explore the following themes:

What are the dynamics of social entrepreneurship and how can they be understood using models coming out of complexity science, e.g., dynamical systems, catastrophe theory, and emergence?

What do we mean by social value creation in a systems sense, and how can it be measured? We will compare and contrast economic and social value creation approaches.

What are the nature and influence of institutional structures and patterns on social entrepreneurship dynamics? How can researchers and practitioners determine the likely impact of alternative policy interventions and how might government policy be used to shape social entrepreneurship dynamics?

How can collaborative efforts cut across different academic disciplines or fields in order to introduce new methods and approaches to these issues?

Note: Workshop text required! Participants may purchase the following mandatory workshop text online in advance or, at a significantly discounted price ($40), at the conference. To reserve a copy for purchase on-site, look for the book reservation option on the SCTPLS online registration page (or hard copy form later in this newsletter).

Goldstein, J. Hazy, J. & Silberstang, J. (2009). *Complexity science and social entrepreneurship: Adding social value through systems thinking*. Litchfield Park, AZ: ISCE Publishing.

Available for online purchase at http://iscepublishing.com/catalog_detail.aspx?Value=60&AspxAutoDetectCookieSupport=1

***Stephen J. Guastello* – Catastrophe Theory and Its Applications**

Catastrophe theory describes and predicts discontinuous changes of events. It is perhaps one of the earliest modes of nonlinear dynamics to cross into the social sciences with empirical supporting evidence. Catastrophe models range from simple to complex, and involve different configurations of attractors, repellors, saddles, bifurcations, and control variables. This workshop will cover basic principles, some classic applications, and the statistical procedures that anyone can use to test catastrophe models. Emphasis is placed on techniques that can be performed with popular and available software. Recommendations for experimental designs are also included.

***Dave Pincus* – Nonlinear Dynamical Systems and Clinical Psychology**

This workshop is designed for anyone interested in the application of nonlinear dynamical systems (NDS) theory to research applied topics in clinical psychology, from expert level clinicians and researchers to interested lay individuals who are new to NDS. The workshop will be divided roughly into research and experiential sections; with significant overlap between the two. The research-oriented section of the program will begin with a review of the current state of affairs within and among the various approaches to understanding personality and psychotherapy, relying upon four very broad categories: (1) Psychodynamic; (2) Cognitive-behavioral; (3) Experiential; and (4) Family systems. Using self-organization and related NDS concepts, these approaches will be integrated within the more parsimonious model of biopsychosocial dynamics. The most up-to-date empirical evidence will be reviewed relating to topics such as: Discontinuous phase transitions underlying clinical improvements in psychotherapy, the fractal properties of interpersonal process and personality structure, and the use of NDS methods for investigating resilience and wellness. The experiential section of the program will focus upon the use of these NDS concepts to obtain deeper and more integrated understanding of the array of modern

techniques in psychotherapy (e.g., process-comments, empathic understanding, mindfulness practices, paradox, desensitization, and cognitive interventions). The program will conclude with a special emphasis upon the use of less widely known deep, transformation imagery techniques including live clinical demonstrations of these techniques.

***Sara Nora Ross* – How Order is Constructed in the Process of Emergence & Decision Making: Fractals Through and Through**

In this workshop, Ross reviews basics covered in her 2009 workshop, and builds on them to show—and invite participants to *experience how* and *to measure*—the kind of fractal dynamics that are building blocks of what emerges in "emergence" and in particular, in individual and group decision making. The workshop emphasis is on a detailed look at not only (a) the nonlinear transition dynamics that generate increased complexity, but also (b) how they nest fractally as we process information. These increases in complexity are directly related to adult and other kinds of development, as accounted for by the general, math-based theory known as the model of hierarchical complexity.

Every decision is the result of having performed one or more of these multiple transition steps. When decisions are more complex, there are nested fractals of information processing required. Some decisions are more "complete" than others, and to analyze this is a core skill for evaluating the adequacy of individual and collective decisions.

The workshop is relevant to anyone who wants to measure/analyze behaviors, whether in consulting or research. It is a must for those interested in such areas as "decision making under uncertainty." Workshop methods include presentation, individual and group exercises, reflection, and discussion.

Registration Information

SCTPLS will manage registration for the conference and pre-conference workshops. Lodging options will be included on the conference website. Register online or use the registration form on page 17 below.

Conference Rates for 2010*

Conference registration:

Regular members	$195
Student members	$145
Non-members	$280

Pre-Conference Workshops (4 hours each):

Regular	$145
Discount price, 2 workshops	$240
Students, each workshop	$ 95

*Fees include refreshments and the July 23 banquet.

April 30 (Friday). Call for abstracts closes.

May 15 (Saturday). All acceptances finalized by Program Chair.

June 1 (Tuesday). Students who have a paper accepted for presentation must be active members by this date in order to qualify for a Scholarship Conference Fee Waiver. www.societyforchaostheory.org/membership.html. Interested qualifying students should contact Dr. Dick Thompson dick@hpsys.com.

June 22 (Tuesday). All speakers must register by this date to remain on the program.

July 1 (Thursday). Cancellations of conference registration will be subject to a 25% service charge starting on this date.

July 8 (Thursday). Last day for early-bird conference registration. Cancellations of conference registration will be subject to a 50% service charge starting on this date.

July 15 (Thursday). Cancellations of conference registration will be subject to a 75% service charge starting on this date.

July 21 (Wednesday). We regret that we cannot offer any refunds for cancelled registrations received after this date.

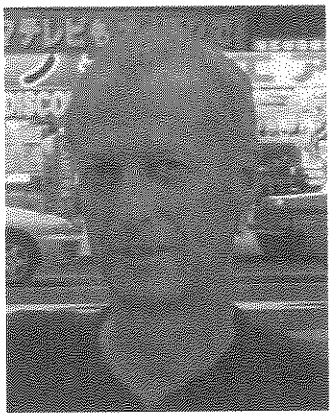
July 21 (Wednesday). Arrive if attending morning workshop or starting the fun early!

July 22 (Thursday). On-site registration and workshops starting 8:30 AM. Sunset session with guest speaker.

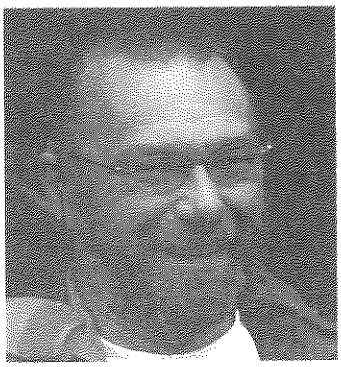
July 23 (Friday). Conference day. Reception and banquet starting at 5:30. Guest speaker.

July 24 (Saturday). Conference day. Annual business meeting.

HIGHLIGHTS of the 4th INTERNATIONAL nonlinear SCIENCE CONFERENCE



Rolf Pfeifer: "Self-organization, embodiment, and biologically inspired robotics"



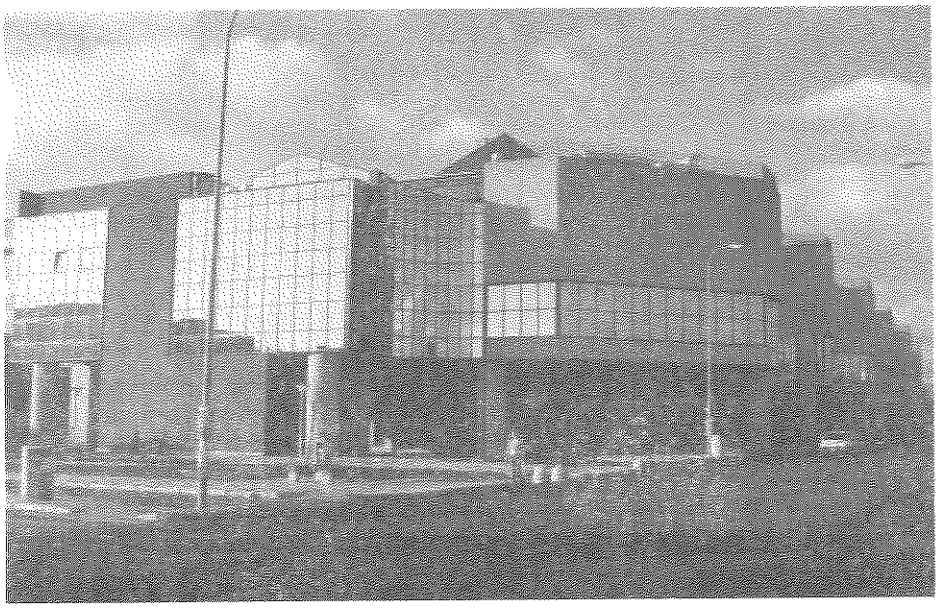
Paul van Geert: "The human life span as a complex dynamic system"

The 4th International Nonlinear Science Conference, which was held at the University of Palermo, March 15-17, 2010, was another great success. Major credits go to Gaetano Aiello, our conference chair, who did the predictable task of making the unpredictable look so smooth. The conference opened with a few welcoming remarks from a representative of the Assemblea Regionale Siciliana, a governmental scientific agency, which was one of the co-sponsors for the event, along with University of Palermo and its DIFTA program.

Next, Rolf Pfeifer, our first featured speaker, shared the latest developments in the construction of robots, and the psychological problems involved. "Biological organisms have evolved to perform and survive in a world characterized by rapid changes, high uncertainty, indefinite richness, and limited availability of information. Industrial robots, in contrast, operate in highly controlled environments with no or very little uncertainty." He contrasted two notions of intelligence. In the classical view, intelligence is a form of computation, or is at least rendered as such when one tries to program it. The embodiment perspective, on the other hand, recognizes intelligence as a self-organizing result of cognitive capabilities, sensorimotor functions, and interactions with the environment. The system requires adequate sensors for haptic, proprioceptic, and visual information (at least). The robot requires a certain amount of knowledge of its own physical capabilities, how its "limbs" move, how its joints work, and preferred trajectories of movement.The latter evolve with experience, and are controlled to some extent by the materials from which the robot is made, and not entirely from a central cognoitive subassembly.

Paul van Geert, our second featured speaker, started the afternoon sessions with his new dynamical perspectives on development across the lifespan. He covered several themes, and it is possible to capture only a few of them here. Importantly, there are two dynamical perspectives on development. One utilizes catastrophe models to depict transitions in stages of development, where the transitions can be characterized as phase shifts. In this view, attractors are limited in number and self-sustaining. In the view of self-organized criticality, however, attractors are critical states where any internal influence can influence changes in the underlying power law relationships. A nexus of factors influencing development are shown in Fig. 1. Goals, which can always change, serve as attractors, and the parents often define them. The child's actions and actions that are taken to pursue the goal are regulated in part by the level of adult support; the level of support is a further result of the parents' and child's mutual adaptation. The child's behavior, however, is a result of both attractor and repellor forces. There is both a rate of approach (attractor) and an optimal distance to the parents.

The frequency distribution of exceptional talent or excellence is usually depicted as exponential or as a power law. For instance, if one were to take a normal



LEFT: Aule Didattiche-1, where our meetings were held.

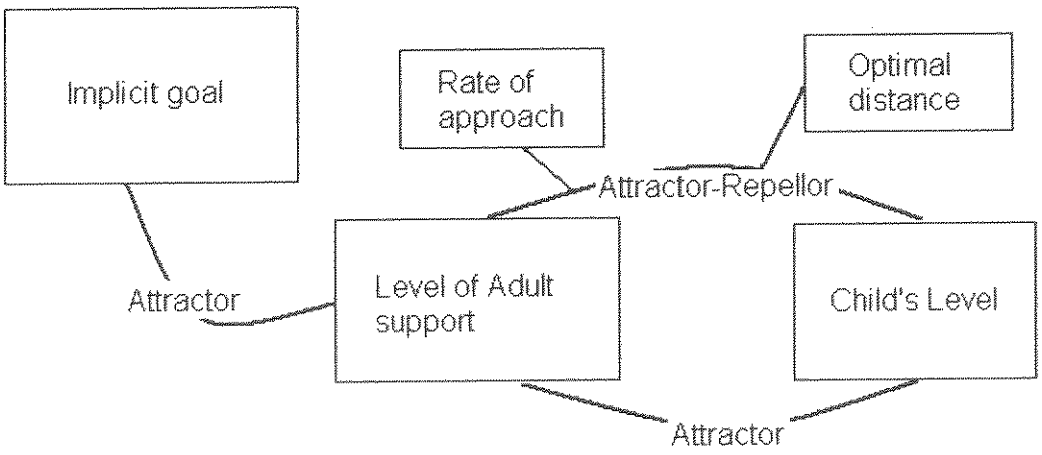
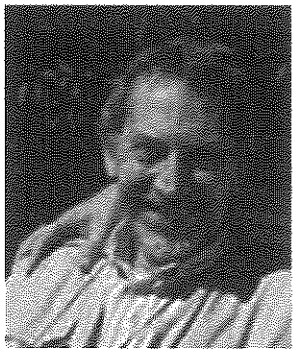


Fig. 1. Dynamical system for human development.



F. Tito Arecchi

distribution of some underlying variable, lob off everything except the "excellent" part of the distribution, and see the shape of the results. According to van Geert, there is a lot going on in that section of the distribution, not dissimilar to the dynamics shown in Fig. 1. The network of underlying constructs, however, is thought to be qualitatively different from what might be occuring in the rest of the distribution. Hence we have the distinctive nature of excellence.

In the evening of the first day of the conference, we alll joined together for an excellent multi-course Italian dinner at a fine restaurant in Palermo that probably wants to remain nameless at the moment. The dinner was actually planned for the evening of the second day, but we found out about 36 hours ahead of time that the restaurant would be closed on Tuesday, but Monday night would be perfectly fine for us. So we adapted. We were also informed quietly that the extra police patrols in the area of the restaurant were for our protection. We'll leave the explanation to the readers' imagination.

Tito Arecchi, our third featured speaker, started the second day. Arecchi joined the conference after the last *Newsletter* was published, so his abstract appears at the right. Once again, it is possible to capture only a few themes from this presentation here. First, a trajectory, such as the arrow in Fig. 3, that is viewed out of context

Fig. 2. Dinner!

"Dynamics of Consciousness: Complexity and Creativity"

The cognitive problem is how a given sensorial input elicits a decision. Since neurons undergo deterministic chaos , information is lost in course of time. Control of chaos reduces such a loss rate by adding extra degrees of freedom. This addition is a change of code; such a re-coding occurs on two time scales, namely, (A) the cognitive one (lasting up to 3 sec), within which the brain reaches a collective state associated with a perception, and (B), the linguistic one (beyond 3 sec), whereby memory retrieves different (A) units and compares them. In (A) the neurons are mutually coupled in large networks ; collective synchronization of neuron arrays elicit decisions. In (B), different (A) slots are compared after retrieval from memory. This requires a subject conscious of him/herself as well as of the pieces of the stream to be correlated. While in (A) the neuron synchronization is described in dynamical terms, in B) the slot comparison is formalized by an inverse Bayes rule. Distinction of (A), that we have in common with animals, from (B) where we formulate attributions of truth, recovers the fundamental philosophical difference between apprehension and judgement.

F. Tito Arecchi is Professor Emeritus at University of Firenze. He is the author of seven books and over 400 journal articles on topics that include: Cooperative effects in quantum optics, photon statistics and laser fluctuations, deterministic chaos in optics, pattern formation in extended media, complex phenomena and cognitive processes. His most recent book is entitled, Cooperation, Complexity and Creativity (publ. S.Di Renzo, Roma, 2007).

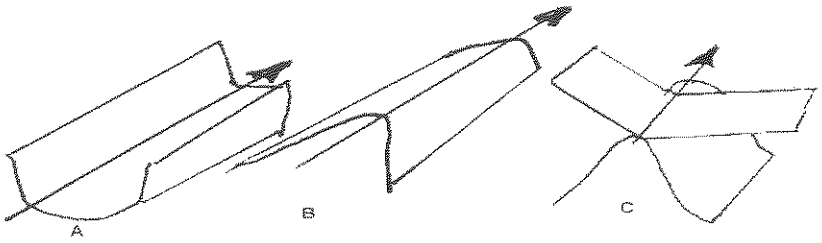


Fig.3: A trajectory can be the result of a stable underflying system (A), an unstable dynamic (B), or a saddle produced by a 2-D control plane attached to the unstable system (C).

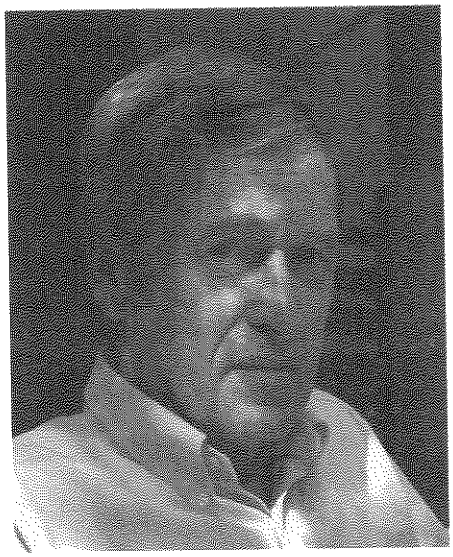
could be the result of a stable underlying function, an unstable system with a great deal of information loss, or a system with an underlying instability that becomes stable with a control plane, here shown as 2-dimensional. Trajectories of neural impulses within the brain, for instance from the eye to the visual cortex to the frontal lobe are stabilized by other functions that join the process such as feature analysis. There are delays at several stages of the process, however, that have a substantial influence on the outcomes, with stability taking the form of synchronization. In *adaptive resonance theory,* there is a cooperative relationship between stimulus input and past memories producing a homoclinic chaos similar to what is shown in Fig 3c.

Creative thought was considered in the context of what could be a scientific hypothesis for the explanation of an interesting phenomenon. Several hypotheses are typically in operation, and the thought trajectories are stable enough to keep them all straight, but unstable enough for the thinker to lock onto one or another. At a critical moment, there is an apriori probability of a hypothesis being true, and the probability of data supporting a hypothesis. The decision to adopt occurs over a three-second interval where the majority of the neural firing trajectories mentioned earler are occuring. Importantly the pattern of search for data, such as one might obtain from eye-tracking experiments, is shaped by the question one is trying to answer.

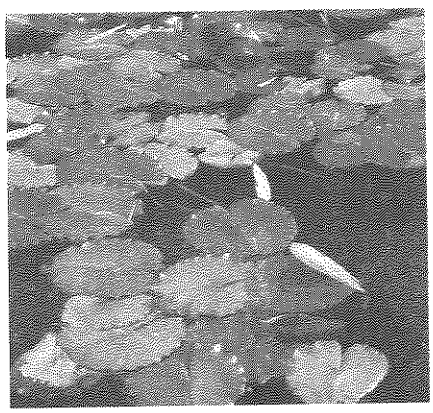
Choices between competing hypotheses could involve small differences in the hypotheses, or sudden jumps to radically different hypotheses. The latter are creative moments when the framing of the question, explanation, and supporting neural search structure has changed many of its underlying rules. These changes in frame are equivalent to paradigm shifts.

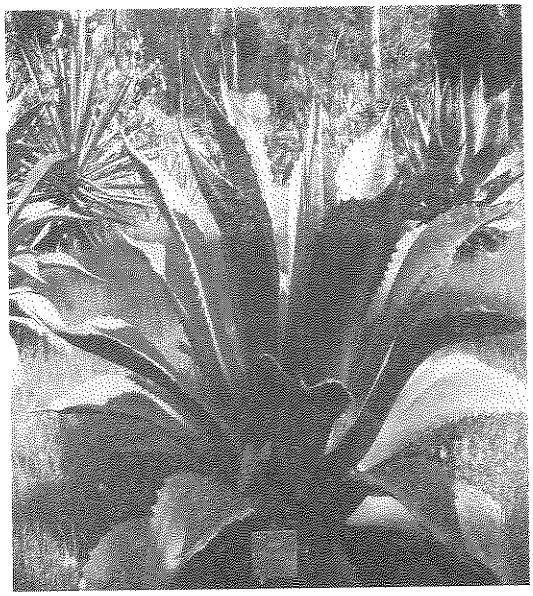
How does an arid environment turn into a desert? Part of what perplexed ecologists for the better part of a century is the patchiness one can observe in vegegation, where large dead spots seem to emerge within an otherwise healthy area. According to Rene Lefever, who opened the third day of the conference, the phenomenon is not readily attributable to the type of plants or to human interference. The fractal nature of the planted and sparse areas indicates self-organizing events, much of which are going on below the surface. Networks of plant roots, water flows, and the topology of the area are actually responsible. Lefever identified conditions where bifurcations in plant growth would be possible. The age of the plants is a contributing variable.

Rosario Mantegna led the final segment of the conference. The thrust of his research indicates that "statistical physics concepts such as stochastic dynamics, short- and long-range correlations, self- similarity and scaling, correlation-based networks can be used to model the global behavior of econ-

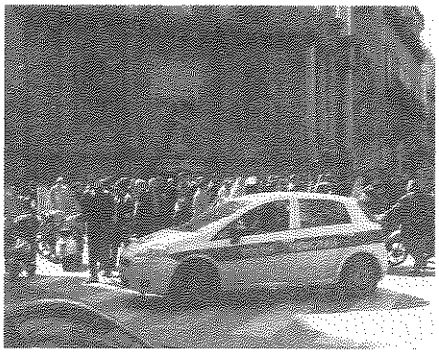


Rene Lefever: "Deeply gapped vegetation patterns and desertification: A topical Ostwald ripening process"
BELOW: Some intriguing specimens from the Botantial Gardens in Palermo.





Rosario Nunzio Mantegna: "Empirical investigations of economic and social complex systems"

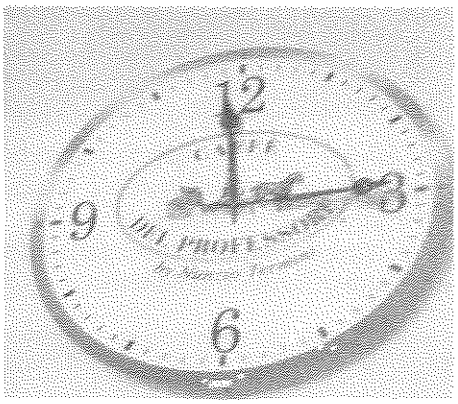


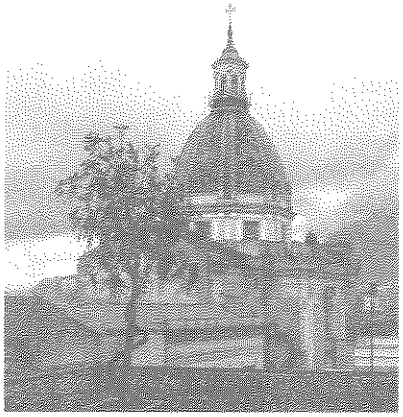
Protest of economic conditions in Palermo

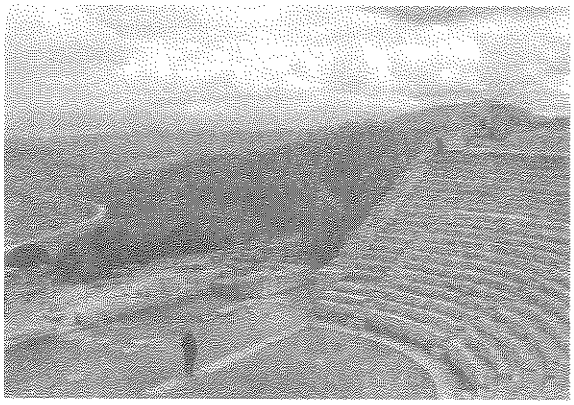
omic systems. Mantegna's current research is focused on the analysis and modelling of financial markets; econophysics, social systems, biomedical and biological complex systems." Importantly, the "econophysics" idea that he started in 2000 with H. Eugene Stanley predated the economic crisis issues that have come to the foreground in the last two years. For many years there was a recognition that the classical and neo-classical paradigm of economics, with its emphasis on equilibria that are only disturbed by external shocks, was not explaining real economic events. Rather economic phenomena are dynamic, and many of constructs from nonlinear dynamics are necessary for reinterpreting phenomena. Perhaps one of the more important single ideas is that economic change results from intrinsic or autonomous dynamics, and policies need to be formulated accordingly. SCTPLS members are probably familiar with some of the articles on nonlinear economics that have appeared in NDPLS in the past few years.

I should also remark on the dozens of individual presentations that covered the full range of NDS applications from biology to economics. Presentations often took on additional levels of meaning when there were juxtaposed with others in the paper presentation and poster sessions. For instance, what Joe Jacobsen and I were trying to do with diffusion of innovation benefitted greatly from presentations by Klaus Jaffe on measuring syngergy, and from Yamashiro and Malloy's latest on how information transits through networks. Several other research teams that were working on different topics found that they had problems that lent themselves to symbolic dynamics analysis. Finally for this report, Tito Arecchi reminded several of us to consider how lag functions of different durations could affect the observed dynamics of complex systems that we were trying to study. A post-conference edition of the INSC abstracts should be available on the SCTPLS web site (select CONFERENCES) from the home page menu, by the time this Newsletter appears in print. The abstracts will be included in the PsycEXTRA database published by the American Psychological Association.

-Stephen Guastello







Clockwise: Clock in Cafe del Professore, an otherwise generic ice cream and sandwich bar in Palermo; slice of Palermo skyline seen from the hotel; ancient theater at Segusta; castle at Erice; open air market in Palermo.

Feature Article

Swarming Robotics

Casey Geraets, *Marquette University*

The term "swarm" is most commonly associated with large groups of insects – a "swarm of bees" or a "swarm of ants." Flocks of birds or schools of fish are analogous idioms. These organized yet seemingly chaotic interactions have recently been studied and implemented as a way to organize groups of robots. The application of such biological phenomena to a technological field such as robotics presents certain challenges. There are requirements to meet in producing a swarm of robots: though social insect and animal interactions come instinctively, these must be programmed into a robot. Along with such requirements to produce a swarm, there are more involved for controlling a "swarm" once it had been created. The creation and control of a "swarm" are two of the major concerns associated with swarming robotics, but there are many other special challenges that need to be assessed for the implementation of a swarming robotic system.

In a general sense swarm robotics is an approach to coordinate large number of simple robots to work as a group, and as a whole perform tasks too complex for any one individual to carry out, much like the social interactions observed in ants, bees, wasps, and termites (Sahin, 2005). A desired collective behavior emerges from the interaction and coordination among the robots as well as with the environment. The coordination capabilities observed in nature are far more complex than the current multi-robot systems, though today's systems have great advantages over the systems of the past.

Three main motivations drive the use of such swarm robotics in multi-robot systems. Robustness, flexibility, and scalability are the three major advantages presented by the synchronized operations of social insects and animals (Sahin, 2005). The robustness of swarm robotics allows for continued operation, though possibly at a reduced performance, despite the failures of individuals within the group or changes to the working environment. Four separate factors contribute to the robustness of swarm robotics: the redundancy of the system, the decentralized coordination, the simplicity of the individual, and the multiplicity of sensing. Redundancy allows for the work of an individual that is lost or malfunctioning to be compensated by another, effectively making the individual in the system disposable. With decentralized coordination, no specific portion of the group contains the ability to coordinate the entire system. If a certain portion of the group is destroyed, there will be no effect on the coordination of the rest of the group and operation will continue unhindered. Compared to the overall complex system, the individual is simple, less prone to failure and easier to mass produce. With a large group, the sensing or perception of the surrounding work environment is distributed among a large number of individuals, effectively reducing the amount of noise present in the system. Through different coordination approaches, swarm robotics also has the flexibility of a system to present different solutions to different problems when changes in the environment are faced. Scalability is the third motivation for the use of swarm robotics. A system should be able to operate at different groups sizes, from the extremely large to a small few. In other words, the coordination procedures should allow for the operation of the system to be minimally effected by the change in group size (Sahin, 2005).

Complex computer programming using different algorithms is necessary to create a multi-robot system that "swarms." Swarm algorithms, derived from the foraging activities of social insects in nature, produce different coordination mechanisms, enabling the group as a whole to synthesize patterns unpredictably (Beni, 2005). Though multiple algorithms have been developed to create the "swarm" effect within a multi-robot system, the effectiveness of those algorithms is limited by the communication between the controlling software and robots, as well as robot-to-robot communication. Because the robots communicate only locally, that is, with a small portion of the collective as a whole, effective communication among robots is required for the system to be established effectively. The specific type of communication is dependent on certain main factors; the size of the robot, the type of environment in which the robots operate, and the project budget (Kornienko, 2008). With increasing size of the robot, the possibilities for types of communications increases as well. With large enough robots, possibilities such as bluetooth, wireless local area networks (LAN), and infrared sensors can be used for robot-to-robot communication to effectively establish the "swarm" effect in the system. The designer of the system must select parameters carefully. For example, the communication range of the robots must be gauged: too short and the robot is unable to communicate with its surroundings; too long and the signals may become jammed because each robot has to read every message that it receives. The benefits and opportunity costs must be weighed and analyzed in order for the proper range to be selected.

Communication area is another factor that needs to be considered in design. Ideally, a robot can communicate effectively in all 360 degrees, but this isn't always the case and must be considered. With hindered communications, the swarm behavior may not be

realized within the system (Kornienko, 2008). The length of each message sent to the robots also plays an important role. Short messages tend to have a lot of overhead because of the header in the message declaring the identity, target, etc., while longer messages have a higher tendency to fail or be misinterpreted. The speed at which the messages or signals are transmitted within the group, the propagation time, can greatly affect the ability of the multi-robot system to exhibit "swarm" behavior (Kornienko, 2008). As in any system, interference and noise must always be considered when analyzing communication between individual components of the system. External influences, whether from other systems or the environment, can inhibit the ability of the system to operate correctly and effectively.

Although there is a multitude of ways to control a "swarm" or large group of robots, there were two complex ideas that appeared in multiple texts and journals. Through interpolated implicit functions and through small abstraction dimensional manifolds "swarms" of robots can be controlled. Control of robot swarms through the use of interpolated implicit functions is accomplished by synthesizing specific shapes or directions through the use of implicit functions. The functions are generated by interpolating from a set of constraint points on a desired curve along with a gradient descent technique and robot-to-robot repulsion made possible through the use of infrared sensors. Sophisticated trajectories which consider spatial constraints and perform dynamic changes within the "swarm" allow for the group to communicate effectively within itself and with its environment (Chaimowicz, Kumar, & Michael, 2005). Another method for controlling a swarm of robots is through the abstraction of dimensional manifolds. The cooperative mission of the swarm is formulated in terms of the Cartesian coordinates of reference points chosen on the robots. An abstraction based on the definition of a map constructed from the space of the reference points that were chosen on the robots to a small dimensional abstraction manifold with the product structure of a Lie group and a shape space, is accomplished by a natural feedback control system on the abstraction manifold. The desired behavior of the "swarm" is realized by feedback depending on the current state of the robot in its environment and the small dimensional state on the abstraction manifold (Belta, Pereira, & Kumar, 2005). The control mechanism of swarm robotics is very complex; it generally does not lend itself to those not deeply involved in robotics, but it is nonetheless extremely important for effective swarm behavior for a multi-robot system.

Another special challenge to be considered is the type of optimization that will be used by the "swarm" robotic system. There are two separate types of optimization: one is Ant Colony Optimization (ACO) and the other is Particle Swarm Optimization (PSO). As the name implies ant colony optimization, ACO, is based on the behavior of ant colonies, whereas particle swarm optimization, PSO, is based on the behavior of flocks of birds or schools of fish.

Ant Colony Optimization was originally proposed by Marco Dorigo in 1992 in his Ph.D. thesis; it is a probabilistic way of solving computational problems that can be reduced to finding good paths through graphs based on the behavior of ants seeking a path between their colony and food (Keller & Gordon, 2009). A family of algorithms was established based on this type of optimization called the ant colony algorithms family, used in swarm intelligence methods constituting in some cases metaheuristic optimization. The ant colony algorithms family is based on the interaction between the colony of ants and a food source. Originally, ants wander at random attempting to discover a food source. Once a food source is discovered, the ant lays down a pheromone trail on its way back to the colony. The next ant leaving the colony is more likely to follow that pheromone trail than it is to search randomly for another food source that may or may not exist. In the optimization of this process there are both positive and negative feedback systems used. The negative system is seen in that the longer the path between the food source and the ant colony the greater the likelihood that the pheromone trail will evaporate. The shorter the trail, the less amount of time for the pheromone trail to evaporate. The positive feedback is seen when the shortest distance between the food source and the colony is located, and that trail has more and more pheromone laid upon it by the succession of ants proceeding between the food source and the colony making even more and more likely that the next ant to leave the colony with follow this path. In this system ants are using their environment to communicate with each other: this is called stigmergy. Though robots cannot leave pheromone trails the algorithms used for the optimization of their processes operates very similarly to the way the ant colony does. The algorithm is originally unstable with no particular edge stronger than the other, but through the positive and negative feedback the algorithm moves to a stable state with one edge showing a clear advantage.

Particle Swarm Optimization (PSO) is a stochastic optimization process developed by Eberhart and Kennedy in 1995 based on the social interaction of flocking birds or schooling fish (Hu, 2005). PSO is a method of numerical optimization without knowing the explicit gradient of the problem to be optimized. Optimization is carried out by maintaining a population of candidate solutions called particles and moving these particles around in the search-space according to simple formulae. The movements of the particles are decided by the best discovered positions within the search-space, which are continually being updated as better positions are found by the particles. The simple formulae that are

used to control the movement of the particles are inspired by the behavior of flocking birds or schooling fish. Since it was originally proposed, the algorithm has been changed and modified by using different velocities to move the particles through the search-space while trying to locate the best position.

The type of perception device and mode used in the design of the robots is another special challenge. Based on the desired functionality of each individual robot and the "swarm" as a whole, certain types of perception devices are necessary. The main type of sensor used today is IR or infrared sensors, especially for position and proximity sensors. Proximity sensors are crucial for a robot to interact smoothly with its environment: these are the sensors used to navigate around obstacles and other robots in a particular environment. The special considerations that go along with those sensors must be evaluated to effectively use these sensors to develop "swarm" like behavior in a multi-robot system.

These considerations go beyond the simpler ones involved with locating the sensors on the robot and the actual number of sensors that are going to be used. The first parameter that should be considered when using choosing sensors is the influence of ambient light on communication and reflection (Kornienko, 2008). The ambient lighting of the environment that the robot swarm is being employed in can greatly affect the ability of the infrared or IR sensors to communicate with their surroundings. Ambient lighting can reduce the amount of reflection in the IR signal back to the sensor from the environment.

Other considerations are the speed of the communication of the signal as well as the size and energy consumption of that sensor (Kornienko, 2008). The speed at which a sensor communicates will greatly affect the ability of the robot "swarm" to recognize and adapt or react to different situations. The slower the communication speed, the slower the swarm can react as a whole. A final parameter is the size and energy consumption of the sensor itself. The robots' design is based on the desired job or tasks to be carried out by a "swarm." The desired goal is to have the robots use their swarm behavior effectively and efficiently to carry out those specified tasks. Depending on the scale of the operations, the size and energy consumption of the sensors can greatly reduce individual robots' effectiveness and therefore that of the entire "swarm."

Swarm robotics is a complex and ever changing field that will, in all likelihood, lead to the greater advancement in robotic technology and the applications in which robots can be employed. Some examples of future applications for swarm robotics, besides the obvious militaristic applications, are mining and agricultural operations. Along with the advancement of the application of swarm robotics, there will also be a corresponding advancement in the need for increasingly sophisticated control requirements. Swarm robotics is a dynamic field that will be explored and furthered indefinitely.

References

Belta, C., Pereira, G. A. S., & Kumar, V. (2005). Abstraction and control for swarms of robots. Proceedings of International Conference on Robotics and Automation, Spain, Barcelona, pp. 1-9.

Beni, G. (2005). From swarm intelligence to swarm robotics. *Lecture Notes in Computer Science* 3342, (pp. 1-9). New York: Springer.

Chaimowicz, L., Michael, N., & Kumar, V. (2005). Controlling swarms of robots using interpolated implicit functions." Proceedings of International Conference on Robotics and Automation, Barcelona Spain, pp. 1-6.

Keller, L., & Gordon, E. (2009). *The lives of ants*. Oxford UK: Oxford University Press.

Kornienko, S. (2008). *Open-source micro-robotic project*. University of Stuttgart and University of Karlsruhe. Retrieved 22 March 2010 from <http://www.swarmrobot.org/tiki-index.php>

Hu, X. (2005). Particle swarm optimization. *Particle Size Optimization*. Retrieved 21 March 2010 from <http://www.swarmintelligence.org/>.

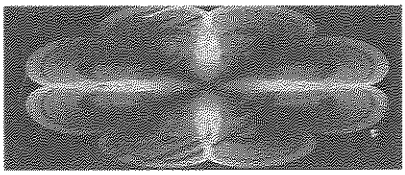
Sahin, E. (2005). Swarm robotics: From sources of inspiration to domains of applications." *Lecture Notes in Computer Science* 3342 (pp. 10-20). New York: Springer.

Members' News

Julien Clinton Sprott has a new book out. *Elegant Chaos: Algebraically Simple Chaotic Flows*. This heavily illustrated book collects in one source most of the mathematically simple systems of differential equations whose solutions are chaotic. It includes the historically important systems of van der Pol, Duffing, Ueda, Lorenz, Rössler, and many others, but it goes on to show that there are many other systems that are simpler and more elegant. Many of these systems have been only recently discovered and are not widely known. Most cases include plots of the attractor and calculations of the spectra of Lyapunov exponents. Some important cases include graphs showing the route to chaos. The book includes many cases not previously published as well as examples of simple electronic circuits that exhibit chaos. It's the first book to focus on mathematically elegant chaotic systems. This book should therefore be of interest to chaos researchers looking for simple systems to use in their studies, to instructors who want examples to teach and motivate students, and to students doing independent study.

Re-View Corner

The Re-View Corner invites members to pull up a chair, sit down, and take time to share what they are reading, learning from, experiencing, reacting to, and reviewing.



From the Rosetta Stone to Temes: Report of the 2010 Winter Chaos Conference

Frederick David Abraham, Scribbler

First I want to thank the members of the Snowflake/Blueberry community for making this conference over the years a most congenial topoi. The innovational genius of our participants blossoms into a congenial shared generation of a network of new ideas. I will not try to repeat or paraphrase each narrative; that can be found via our websites, but rather I will try to capture some aspects of the shared experience filtered through my own philosophic perspective, which generally will follow the confluence of three styles of thought: systems theory, postmodernism, and semiotics.

Postmodernism, an American invention improvising on themes provided by a cluster of contemporary social philosophies (such as philosophical hermeneutics, critical theory, post-structuralism, etc.), which is a transformative mix of existentialism, depth psychology, and Marxism, looks to a destabilization of many centering ideological (and destructive) social constructs and practices. Much of the theorizing centers on the destabilization of language and other signifying aspects of modern culture. There is an obvious point of communality of this view with basic ideas of both dynamics and semiotics, that of instability, change, multiple meanings, and alliances. I once proposed to a friend that we write a joint article on this mutuality of dynamics and postmodernism, to which he replied that they were oppositional. I said I recognized that, so why propose they bed together? True a finite set of ordinary differential equations seems like a closed system, but there are two contributions to the subversion of this closedness. One is that the parameters are open to outside influence (by definition). The other is that which made dynamics almost elevated to the position of religion for many of us, namely that it seemed to emphasize an interconnectedness of just about everything in the universe. So it is easy to dispense with this paradox. How was this idea expressed in our conference (actually it wasn't, this is just a reconstruction of mine)?

Thanasis Argyrioy, our Greek philosopher and newcomer to the conference, eloquently expressed a view, similar to that of philosophical hermeneutics and other phenomenological philosophers, that science and rational methods are inadequate to capture the full nature of the human experience. I think there is an implication that compassion, empathy, and sympathy depend upon a mutual recognition of this shared and to some extent inexpressible individual phenomenology. This phenomenology shares many of the properties of dynamics.

A similar issue came up simultaneously with its appearance on Chaopsyc during the conference when I read a portion of Terry Marks-Tarlow's statement which dealt with the issue of evaluating the success of therapy. Robert Galatzer-Levy noted that attempts to evaluate therapy have missed the mark because the therapy involved processes too subtle for traditional attempts to scale and code them. Some meanings are hidden and denied both in individual experiences and in human discourse. One must destabilize (deconstruct) the system to obtain sufficient (though never complete) understanding in order to change it. Robert emphasized the coupled nature of the psychoanalytic process was chaotic in that it provided multiple potential courses of action, and sensitivity to initial conditions. Again, a great similarity to the potentialities suggested by social discourse for discovering alternative trajectories, along with the uncertainly and multiplicity of meanings involved. One might also note that some researchers have tried to code levels of therapeutic description that would yield to system-theoretical analyses.

There were other examples of this same theme. Lydia Emerencia, whose efforts, as Rector at the University of Aruba, for educational and administrative innovations, use an "insiders' research" methodology that is very much like the interior perspective on the evaluation of therapy methodology advocated by Galatzer-Levy. Using "insiders" gives an interior view of the system that transcends even the potentialities of ethnographic research. It depends on the interior view of the dynamics for identification of the potentialities for destabilization and bifurcation, but as in therapy, with a sufficient subtlety as to allow the process to proceed endogenously.

Consciousness also seems to possess some instability conceptually as well as in actuality. Weili Luo, a physicist, discussed the difficulties in the studies of consciousness. She suggested to divide the conscious experiences to the ones that directly or indirectly interact with the

external environment such as consciousness associated with our senses and that with processing the information from our senses and the one that is purely subjective. Then she further divides the subjective experience in the one relying on language, thought, and concepts and the one that is completely independent of those.

Two proposals were made for the purely subjective experience: (a) There exists an intrinsic awareness (IA) that does not depend on the external environment nor our sense organs and our mental activities; (b) This IA is the ground state of the consciousness, meaning that all our conscious experiences are the manifestations of this IA. Weili introduced the properties of IA and argues that because IA is irreducible to components the reductionist approach is not applicable for the studies of IA. This work provides an answer to the "hard problem of consciousness" proposed by Chalmers.

Linda Chamberlin presented a view of addiction that emphasized its multiplicity (which fits our theme), but also its commonality from the viewpoint of systems theory, as a "collapse of complexity," what I have called "implosive bifurcations" as a generalization of my brother Ralph's third category of bifurcations (explosive, just reverse the controls; the first two being subtle and catastrophic bifurcations). This is different from most of the examples given in dynamics in which complexity generally increases, but it does follow the idea that while there are trajectories that can follow paths of very low and very high dimensionality, that healthy psyches, bodies, aesthetics, and societies, and semiotics are generally those that exhibit attractors with what I call mid-dimensional complexity.

I have presented these newcomers to our Snowflake community first not only to illustrate a common theme, but to revel in the input of their new fresh ideas. Now I will mention a few of the ideas introduced by some of our regulars. I start with Roulette, whose interest from a medical perspective, apparently "magic bullet-like," includes genetics and DNA, which might lead one to suspect it does not fit the paradigm I present here, but in fact, it very much does. He is very much interested in how these things influence disease and individual and cultural development. He is our resident polymath. He suggests that

> Autovirulence" involving transmissible and infectious stress-activated EBV small RNA secondary particles can explain etiologies of autism spectrum disorders, schizophrenia, selected other neuropsychiatric disorders, selected congenital phenomena (e.g., mosaic Down syndrome) and even selected instances of male homosexuality. First, I suggest non-linear dynamics associated with an epigenetic mechanism (dubbed 'autovirulence)'; associated with a priori molecular events may give rise to cascading a posteriori molecular and other downstream consequences[like Lorenz's butterfly effect]. Stress-activated autovirulence associated with EBV and some adenoviruses effectively interfere with genetic encodings. Its consequences are associated with more than 100 syndromes, disorders, diseases et al. (including cancers, autoimmune disorders, molecular mimicry, de novo mutations, and panoplies of other neuropsychiatric, endocrine, exocrine, and molecular and physiological presentations. Second, because a posteriori consequences can be delayed, slowly progressive, quite complex and enigmatic, we re-introduce and refine a notion of logistic reasoning (LR)– a now refined GPS-like reasoning strategy - designed to capture underlying logics of look-ahead, anticipation, feed-forward and feedback, fault and error analyses, and goal-setting and goal-attainment. LR is shown to replace the classic Henle-Koch postulates often cited as a basis for discerning causality associated with infectious pathogens. Perhaps more important, our findings presage needs for novel approaches to pathology (involving LR), disambiguating genetics and congenital conditions, semantics (involving aberrant conditions, syndromes, disorders et al.), semiotics (of transmissible and infections secondary particles), and, logic, methodologies and philosophy of sciences. [Some editorial liberties taken by the author.]

Carlos Torre, along with Hector Sabelli, plans to introduce medical education into New Haven schools where Carlos is head of the board of education and is directly linked to Obama. This education features not merely the usual aspects of health, but includes also the idea of evaluating health information, and not just relying on the information as presented by the media, the health profession, and their surrogates (parents, teachers).

Jerry Chandler has spent a considerable number of years successfully developing a logico-mathematical representation of chemical behavior which he calls the Perplex system. He works from the viewpoint of biosemiotics, and thus provides a metaperspective of the relation between a great number of symbol systems, which he likens to the Rosetta Stone. This provides the semiotic aspect of the importance of the context of these systems, and the multiplicity of meanings that any interpretive act demands.

George Muhs performed a similar function, taking the basic symbols of dynamics, such as attractor, and making them the basis of a language with which one can analyze and treat illness, in his case, his chiropractic practice.

Karen VanderVen fascinated us with her display and slides of seashells, which demonstrate basic patterns (spiral of the shell, color patterns on the shells), which follow difference equation and growth principals in common with dynamics. The work of Oster et al. on neural feedback from sensory "tasting" of the shell by the mantle of the mollusk controls via the nervous system to output of the pigments during growth was also mentioned. Karen took a couple of us shelling on the Tampa beaches at low tide at night. Quite an experience. Thanasis got to take his shells back to Greece.

Last, but not least by any means, I quote rather than mention our resident humoritarian, the Robin Williams clone in the world of somatic education, Mark Filippi, who gave a brilliant analysis of the interaction of media, culture, and practice, and its implication in our lives. Here is his abstract, The Tyranny of Temes.

> After a decade or so of examining the neurobiology of the social brain from both a clinical and colloquial perspective, I decided to take a detour this year into the technical world of social media to look for ways it's impacted our behavior. What I found out was that all the chatter within the NDS community about 15 years ago about AI has now found its home in the realm of temes - technological memes. WTF are these suckers? I turned to Susan Blackmore for help..."Earth now has three replicators - genes (the basis of life), memes (the basis of human culture) and temes (the basis of technology). I argued that the information copied by books, phones, computers and the Internet is the beginning of this third replicator and consequent new evolutionary process.We already have plenty of temes. We are on the verge of having true teme machines, that is machines that carry out all three processes of copying, varying, and selecting information without us. This new teme evolution is fast, and powerful and we would do well to try to understand it." (Susan Blackmore)
>
> As a non-techie, I looked for where the natural and digital world where overlapping. We saw the role Twitter played in the Iranian elections in the spring. Then Google made Facebook their pet. Kindle is rapidly causing booksellers to close down. The evolution of the iPhone and Blackberry continue to make our social life non-local. But for me, the temetic takeover got real when fans were openly pleading for instant replay in the World Series. I'll be discussing how events like those coupled with a growing cultural appetite for more technology has reached the point where temes are becoming a control parameter on our memetic lives. What can we do to adapt to this and how can keep the ghost in the machines?

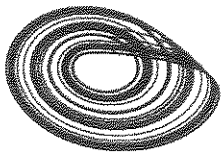
During the conference we had an open discussion on this issue from the viewpoint of media ecology, the interaction of the communication technologies and culture which emphasized both the convergent forces of global capitalization and the divergent forces of social movements, which are leading to the transnational/globalization of power both those serving large capitalist conglomerates and civil rights. It is generally conceded that these are making nation-states less important. But the forces of capitalism seem to be winning overall in exploiting cheap labor and regulatory environments, which leads to the kind of implosion on a global scale that Linda suggested for the individual addict. Addiction to capitalism is continuing to lead to the oppression of the poor on a grand scale with capitalism using this technology as a hospitable landscape in which to flourish. This is a major modern bifurcation, and poses a responsibility to develop a landscape hospitable to liberation.

Robert Porter (conference organizer), Bob and Connie Eldridge, perennial members of the Snowflake community, and Jack Lillibridge added considerably to the discussion. For more adequate representation of contributions and comments, see our pages at Blueberry-brain.org and Implexi Mundi. At the suggestion of Mark Filippi and George Muhs, we hope to have some mini virtual sessions via the internet during the year. These could be short conversations discussing material by one of our members, or of some other related paper. We also encourage continued commentary via our Implexi Mundi website; some have already been posted.

Want to know what more members are thinking and writing about?
Looking for interaction with other members?

Visit and post to the SCTPLS Blog at
http://www.societyforchaostheory.org/blog/

Check out the SCTPLS forum and listserves. Visit
http://www.societyforchaostheory.org/chaopsyc.html



Society for Chaos Theory in Psychology & Life Sciences

Registration and Membership for 2010 Annual International Conference and Workshops

To ensure proper credit, please complete the following and return with your payment. Please print clearly.

Name _____

Address _____

City/State/Province/Zip/Postal Code _____

Country _____ E-mail _____

Students: What is your institution and program of study? _____

Please check your registration choices on the form below. If you are paying by check, the check must be payable in US Dollars, drawn on a US Bank, to: Society for Chaos Theory in Psychology & Life Sciences (or SCTPLS). Return this form with your payment to **SCTPLS, P. O. Box 484, Pewaukee, WI 53072 USA;** or use the **FAX: 1-414-288-5333;** or send by **e-mail** to **register@societyforchaostheory.org** You can also use our on-line form: **www.societyforchaostheory.org/membership.html**

1. **CONFERENCE REGISTRATION** (includes banquet, Fri. 23 July) – Before 8 July, 2010

_____$195 Regular members
_____$145 Student members
_____$280 Non-members (You can join now and qualify for membership discounts now. See below under membership options)
_____$ 25 Additional starting 8 July, 2010

2. **WORKSHOPS** – Regular Members: 2 workshops for $250.00 !

Hierarchical Complexity
(S. N. Ross, 8:30AM –12:30 PM)
_____$145 Regular
_____$ 95 Students

Clinical Psychology
(D. Pincus, 8:30AM – 12:30 PM)
_____$145 Regular
_____$ 95 Students

Catastrophe Theory
(S. J. Guastello, 1:30PM – 5:30 PM).
_____$145 Regular
_____$ 95 Students

Social Entrepreneuring
(J. Goldstein, 1:30PM – 5:30 PM).
_____$145 Regular
_____$ 95 Students

Note: This workshop has a required text: Goldstein, Hazy, & Silberstang (2009). ***Complexity Science and Social Entrepreneurship: Adding Social Value Through Systems Thinking.*** ISC Publishing. If you don't have a copy already, please mark the book purchase item below. You copy will be waiting for you at the conference site.

_____$60 Text for ***Social Entrepreneuring*** workshop

3. **MEMBERSHIP—New and Renewals**

_____$85 **2009-2010. Regular memberships** (new or renewals) include full Vol. 14 of *NDPLS*, Membership thru 31-August-10, Newsletters, and annual poster.

_____$155 **Two-year regular memberships for 2009-11** (new or renewals) include full Vols. 14 and 14 of *NDPLS*, Membership thru 31-August-11, Newsletters, and annual poster.

_____$70 **2009-2010 Student memberships** (new or renewals) include full Vol. 14 of *NDPLS*, Membership thru 31-August-10, Newsletters, and annual poster.

_____$120 **Two-year student memberships 2010-11** (new or renewals) include full Vols. 14 and 15 of *NDPLS*, Membership thru 31-August-10, Newsletters, and annual poster.

4. LODGING. We will have a selection of local hotels listed on the conference web site. Pick your favorite and make your reservations directly with the hotel.

5. PLEASE TOTAL YOUR SELECTIONS _____

PAYMENT TYPE *(Please note:* Your registration selections will be recorded *when the payment has been received.)*

_____ Check (in USD drawn on a US bank).

____ AMEX ____ Discover ____Mastercard _____ Visa

Card # _____

Exp date _____ Security # _____

Signature _____

CANCELLATION POLICY Cancellations of conference registration will be subject to service charges after these dates: 25% after 1 July, 50% after 8 July, and 75% after 15 July. We regret that we cannot refund cancellation requests received after 20 July.

ISCE Publishing

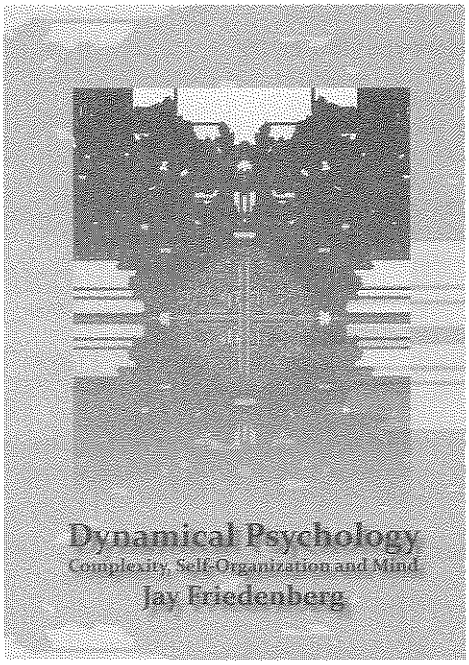
The non-profit publishing division of the
Institute for the Study of Coherence and Emergence
Specializing in Complexity Science since 1999

Dynamical Psychology

Complexity, Self-Organization and Mind

Written by

Jay Friedenberg



2009, ISBN/ISSN 9780981703299 (306 pages + index)
HARDBACK: $55.99
ELECTRONIC: $40.99

Over the past several decades, the sciences have witnessed a significant paradigm shift. Our traditional notions of order, energy, causality and methodology have all been upended. A new set of views has arisen that enables us to better understand and examine the complexity of nature. In this perspective, behavior is nonlinear, order emerges spontaneously and responses are best understood as the movement of trajectories through multi-dimensional space. This book examines the role that dynamical systems, complexity science, networks, and fractals play in helping to explain the most difficult thing of all: ourselves.

"While so many researchers in dynamical cognition are busy writing books that describe theirs and related research in deliciously excruciating detail in books that are perfect for graduate courses, no one seems to be writing novice-friendly introductory dynamical cognition textbooks that will prepare undergraduates for reading those more detailed books when they go to graduate school, until now. Not only should all undergraduate psychology majors read Friedenberg's *Dynamical Psychology*, I think all undergraduates in every major should read this book."

Michael Spivey
Professor of Cognitive Science
Humanities and Arts, University of California.

"*Dynamical Psychology* is a well written, thoughtfully organized synthesis of a host of findings from the fields of nonlinear dynamics, chaos, complexity and self-organization that demonstrates the relevance of these developing areas of study vis a vis the brain. The goal of the book is the establishment of a broad ideological movement in psychology inspired or based on these findings, a movement similar in scope to the ecological, gestalt or connectionist schools."

Daniel Graham
Post-Doctoral Research Fellow
Department of Mathematics, Dartmouth College.

ISBN 978-0-9817032-9-9
90000
9 780981 703299

An excellent addition to your library! Please recommend to your acquisitions librarian.

http://iscepublishing.com

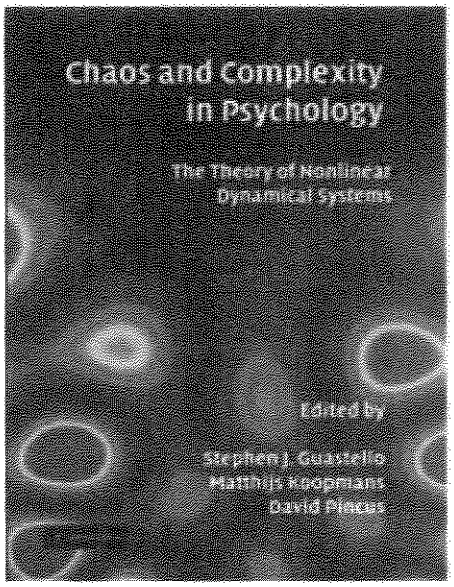
Society for Chaos Theory in Psychology and Life Sciences

Chaos and Complexity in Psychology:

The Theory of Nonlinear Dynamical Systems

Edited by

Stephen J. Guastello, Matthijs Koopmans, and David Pincus



While many books have discussed methodological advances in nonlinear dynamical systems theory (NDS), this volume is unique in its focus on NDS's role in the development of psychological theory. After an introductory chapter covering the fundamentals of chaos, complexity, and other nonlinear dynamics, subsequent chapters provide in-depth coverage of each of the specific topic areas in psychology. A concluding chapter takes stock of the field as a whole, evaluating important challenges for the immediate future. The chapters are written by experts in the use of NDS in each of their respective areas, including biological, cognitive, developmental, social, organizational, and clinical psychology. Each chapter provides an in-depth examination of theoretical foundations and specific applications and a review of relevant methods. This edited collection represents the state of the art in NDS science across the disciplines of psychology.

"Just as did Henri Bergson's L'Evolution créatrice in 1907, James Gleick's Chaos in 1987 crystallized a community of concern for nonlinear dynamic systems. Major progress thereafter is documented in this collection of essays....These chapters provide a new set of initial conditions for the growth of shared knowledge and competence among scholars addressing 'NDS' in psychology."
-Walter J. Freeman, University of California at Berkeley

"This is an excellent, very useful book. The editors have assembled a stellar international cast of leaders in nonlinear dynamics and psychology, and the book provides both broad and deep coverage of "hot" areas of contemporary theory and research. Generous and current reference sections, a well-written introductory chapter, and the rigor of the individual contributions combine to make this book useful as a graduate-level text and as a resource for veterans in the field."
-David Schuldberg, The University of Montana-Missoula

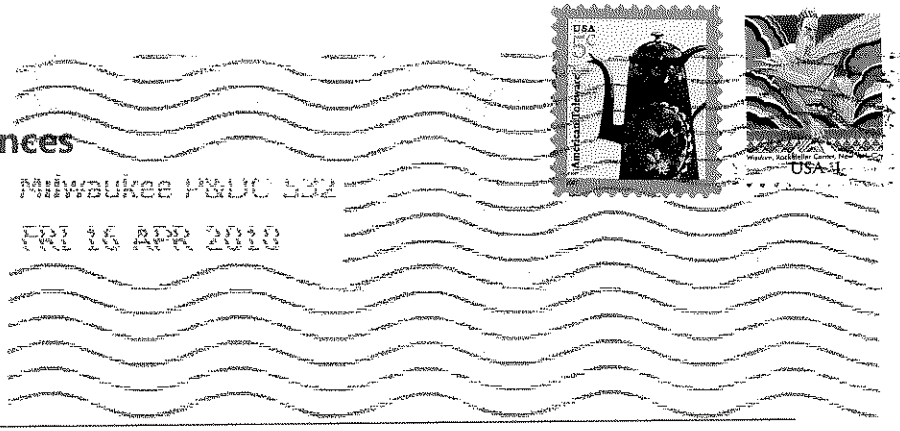
"This collection of articles by leaders in the field shows how psychology is poised to move beyond the linear, static models of the past to a deeper understanding of complex and chaotic human behavior."
-Julien Clinton Sprott, University of Wisconsin-Madison

2009, ISBN-10: 0521887267 (552 pages) $110.00; CAMBRIDGE UNIVERSITY PRESS

An excellent addition to your library! Please recommend to your acquisitions librarian.

If undeliverable, return to

Society for Chaos Theory in Psychology & Life Sciences
Department of Psychology, MARQUETTE UNIVERSITY
P. O. Box 1881, Milwaukee, WI 53201-1881 USA



FIRST CLASS AIRMAIL EVERYWHERE

Your latest issue of the **NEWSLETTER** with

FINAL CALL FOR PAPERS

for the 20th Annual International SCTPLS Conference in
San Marcos, TX USA