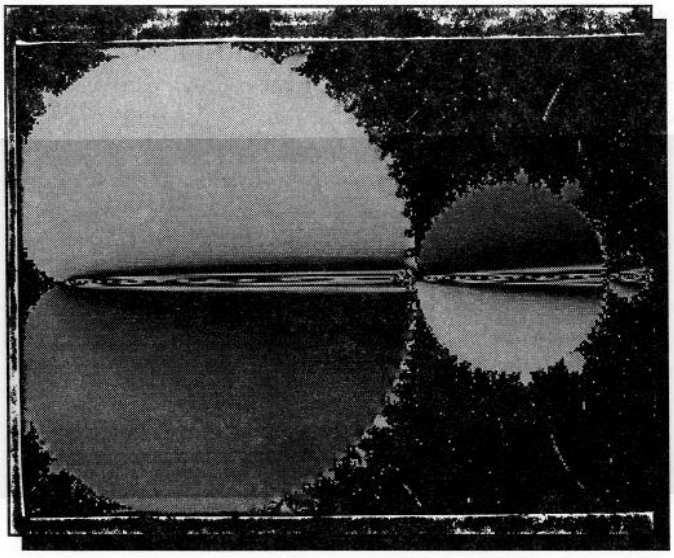
Society for Chaos Theory in Psychology & Life Sciences
NEWSLETTER Vol. 5 No. 3
William Sulis, MD, Ph.D. President & Editor
April, 1998

In this issue: REGISTRATION FOR SCTPLS
8th Annual International Conference
Boston University, July 31- Aug 4, 1998

RETIRING SECRETARY

It is with great sadness that I announce that our Secretary, Keith Clayton, has decided to step down from his duties. Keith has served the Society in many capacities since its inception, and has been secretary since 1995. He has done a truly admirable job of maintaining the Society membership records and was instrumental in establishing and promoting the Society web page. This page has served as our advertisement to the world and has been highly successful in recruiting new members to the Society. It has established a standard of excellence which will be difficult to surpass. For many members, it has provided a window on the ever widening world of nonlinear dynamics and complex systems theory. In addition, Keith has been active in developing educational programs to help newcomers to the field quickly develop some understanding of the basic concepts of nonlinear dynamics. Keith has been tireless and steadfast in his devotion to the Society. He will be sorely missed. Fortunately he will continue to serve as a Trustee of the Society.

Keith's departure leaves an important vacuum within the administration of the organization. Keith has agreed to stay on until the summer meeting in August, but we need someone with enthusiasm and drive to step in and take over the role of secretary. This position is vital to the smooth operation of the Society. In addition we need someone willing to take over the management of the Society web page. We need both a new physical location for the page, and a an individual willing to invest the time in maintaining it and keeping it up to date in this ever changing world. Any of you interested in taking on either of these challenging positions hsould contact either me (sulisw@mcmaster.ca), or Bob Porter (rjpps@uno.edu)



Conference Report:
THE SIXTH ANNUAL WINTER CHAOS

By: Michael Root, Springfield College, Springfield, MA. 01109. Email address: michaelroot@juno.com

This years winter chaos conference was held in the lovely city of Northampton, Massachusetts at The Hotel Northampton between February 13th-15th. The conference was organized by Rick Paar, Associate Professor of the Counseling and Psychological Services Program at Springfield College and Michael Root, a graduate student, also at Springfield College. The theme for this years conference was: chaos/complexity theory presented in an understandable and "user-friendly" manner as applicable to human behavior.

Friday night the conference attendees gathered together for a banquet to introduce themselves, renew old friendships, enjoy an excellent dinner and listen to the keynote address and prefatory remarks by one of the conference organizers, Rick Paar. The banquet was enjoyed by all as evidenced by the lively conversations and general jovial attitude of all involved. This attitude set the stage for the next two days of presentations.

The proceedings on Saturday and Sunday were well attended by a number of people outside the realm of chaos theory which prompted the presenters to describe what their ideas and research in a more simplistic and non-esoteric way, thus carrying on the theme for the conference. Some of the presenters included: Carlos Torre, who presented his work on the "Heart and Mind Project"; Matthijs Koopmans presented on entropy in dysfunctional family systems; Jeff Goldstein gave a talk on the philosophical implications of emergence; Frank Mosca talked about self and freedom; Mark Elin introduced the audience to his theory of brain time; Ben Goertzel talked about his work on web software; and Yaneer Bar-Yam presented on complexity in evolution. All of the talks sparked lively debate and each, in their own way, provided a context in which to further the development of chaos theory and psychology.

Two fruitful attributes emerged from this conference. The first being the conference and its themewhich provided people not readily exposed to chaos or complexity theory a relatively cogent introduction into this increasingly fascinating field. The second, and ostensibly more important attribute, is the

interplay of ideas that permeated the conference so as to allow each attendee to augment their own work in the field of chaos/complexity theory.

WIRELESS NETWORKS FIND ORDER IN CHAOS

A group of university researchers is building a wireless network based on chaos theory that will be tested by the US Army. The hope is that chaos will lead to the development of cheaper network components with more bandwidth capacity. http://www.wired.com /news/news/email/other /technology/story/10993.html

Above news item from: COMMUNICATIONS AND INFORMATION TECHNOLOGY ONTARIO CITO Link-line -- March 23 1998 editor: Anne Tyrie tyriea@cadvision.com Link-line is an approximately weekly electronic newsletter for people and companies involved with CITO. Subscription is over 1000 people.

SEA CLUTTER

Two lectures were presented Dynamics Day at York University March 24, 1998 Professor Simon Haykin (Communications Research Laboratory, McMaster University), Chaotic Dynamics of Sea Clutter. A rigorous procedure for the extraction of chaotic invariants from an experimental time series: Correlation dimension, Lyapunov spectrum, Kolmogorov entropy. Viewing dynamic reconstruction as an ill-posed inverse problem, Haykin described a regularized radial-basis function for the dynamic reconstruction of a chaotic process using an experimental time series. Haykin also described criteria for a successful dynamic reconstruction. In a case study, experimental results were based on real-life radar data to demonstrate the chaotic dynamics of sea clutter(i.e.,radar backscatter from an ocean surface). The lecture with the implications of this important discovery for physics, signal processing and control theory.

DIAL-A-LOG

Michael F Halasz <halaszmf@worldnet.att.net>

The dialogue in Dial a Log published in the Society's Newsletter is fun to read but is unlikely to lead to resolution because it addresses a host of heterogeneous issues. Thus, for example, the relationship between the mathematical and natural worlds is a vast subject not particularly connected to chaos or nonlinear systems theory CT). Neither is the issue regarding the extent to which mathematics is adequately subsumed under the notion of "language." Some authors seem to have made blunders in confusing `bifurcation' (pair-wise appearance of solutions as a parameter passes through a critical value) with splitting of a trajectory into two at a point (not possible in a differential system). However, imprecise, metaphorical language has played a great role in advancement of even physical science, e.g., Faraday's `lines of magnetic force.' Whether `self-organization' as understood in CT will prove adequate to explaining how `ideas,' `archetypes' or even `ordinary' percepts take shape in the mind is an open question, but is certainly worth exploring. Some of us may fail to see any strong tie between CT and Jungian psychology but nevertheless be happy that others are delving into the matter. To this reader the interesting is that which arises from the personal and professional experience of the individual writer, be she/he a psychiatrist, biochemist or administrator, and the effort to make sense of that with ideas such as CT.

Upcoming Conferences

Inaugural Conference: SOCIETY FOR THE MULTIDISCIPLINARY STUDY OF CONSCIOUSNESS August 17-18, 1998, Fort Mason Center for the Arts, San Francisco CA

The Society for the Multidisciplinary Study of Consciousness is a network of people whose goals are to investigate, understand, and disseminate information concerning the topics of consciousness. These goals will be sought within the context of an ever-developing search for
basic scientific concepts and underlying principles that are valid across many disciplines.

Within the broad framework of cognitive science, the first meeting of the Society will focus upon ways we can encourage and organize the establishment of multidisciplinary conceptions and principles of consciousness. Toward this end submissions are invited which address topics of consciousness within the various disciplines and areas of cognitive science, including cognitive psychology, cognitive neuroscience, linguistics, philosophy of mind, artificial intelligence,
and cognition and nonlinear dynamics.

Organizing Committee Brad Challis, University of Tsukuba, cognitive psychology; Anne Jaap Jacobson, University of Houston, philosophy; Earl Mac Cormac, Duke University, radiology; Paavo Pylkkanen, University of Skoevde, philosophy; Maxim Stamenov, Bulgarian Academy of Sciences, Linguistics; Larry Vandervert, American Nonlinear Systems, cognitive neuroscience; Philip Zelazo, U. of Toronto, cognitive & developmental psychology;

Keynote Address: **Karl H. Pribram**, Director, Center for Brain Research and Informational Sciences, Radford University "Conscious and Unconscious Processes: Relation to the Deep and Surface Structure of Memory"

Plenary Panel: **Metaphors of Consciousness**. The aim of this panel will be to discuss the relationship between consciousness and the representations of consciousness in the context of consciousness modeling in the cognitive sciences. The topics of potential interest include (but are not limited to) the following: What are the basic metaphors used in representing consciousness, e.g., the theater metaphor, and so forth? Are there preferences in different disciplines within cognitive sciences to prefer some metaphor(s) at the expense of others and what are the possible motivations for this state-of-affairs? What are the relationships between the phenomenon of consciousness and the images, concepts, models, and metaphors of it? What are the possibilities to develop integrative metaphors for consciousness representation and modeling?

Further information contact: Dr. Larry Vandervert, 711 W. Waverly Place, Spokane, WA 99205-3271 USA. Ph: + 509-533-3585; fax: 509-333-3149. E: larryv@sfcc.spokane.wa.us.

MEASURING BEHAVIOR '98 2nd International Conference on Methods and Techniques in Behavioral Research Groningen, The Netherlands 18-21 August 1998

Following the success of Measuring Behavior '96, we are pleased to announce that the 2nd International Conference on Methods and Techniques in Behavioral Research will be held at the University of Groningen, The Netherlands, 18-21 August 1998. Conference host prof. dr. J.M. Koolhaas and his fellow members of the program committee are pleased to offer you an exciting scientific, technical and social program.

Measuring Behavior '98 will offer a variety of ways to gather and exchange information. The conference program consists of oral presentations, poster sessions, demonstrations, scientific tours, technical training, user meetings and a pleasant social program. There will also be an exhibition of scientific books, instruments and software. And after the meeting, you can explore Groningen and surroundings on one of the post-conference excursions!

Integreation of Behavior and Physiology. Measuring Behavior '98 will devote special attention to the integration of advanced behavioral research with physio-logical measurements. With 'integration' we refer to the measurement of behavioral characteristics combined with in vivo (non-invasive) recording of the dynamic changes in time of physiological parameters. Exciting new developments in both the behavioral and physiological sciences make such an integration feasible. The development of techniques and generic software tools can form a bridge between disciplines, which are often unaware of techniques already available in other fields. For example, data analysis methods stemming from ethology are now being used by applied psychologists, and path analysis techniques originally designed by entomol-ogists are equally useful for behavioral pharmacologists studying rodents. Moreover, recent developments in radio-telemetry, brain imaging, chip technology and biosensor techniques originally used by physiologists are now being used for simultaneous recording of physiological processes and behavior. To this end, we hope that Measuring Behavior '98, just as in 1996, will serve as a common ground for cross-fertilization of research disciplines.

Invited Speakers: Serge Daan *Data logging methods for the study of behavior and chronobiology*. Stephen Ellwood *Remote video surveillance of wildlife behavior*. Laura Goodwin. *Reliability of observational data: obtaining different results with different estimation tech-niques*. Judith Lauter *The "trimodal brain": integrating auditory neuroscience, brain imaging and the study of behavioral disorders*. Walter Tornatzky. *Using biotelemetry for integrated measurement of behavior and physiology in laboratory animals*. Hans Veenema & J.A.R.A.M. van Hooff *Age-related changes in cognitive behavior in relation to rank: using touch-screen displays in large groups of primates*. Berry Wijers *Using real-time neuro-imaging techniques for the study of cognitive processes.*

For more information contact: Measuring Behavior '98, Conference Secretariat, P.O. Box 268, 6700 AG Wageningen, The Netherlands. Phone: +31-317-497677 Fax: +31-317-424496. E-mail: mb98@noldus.nl http://www.noldus.com /events/mb98/mb98.htm

The Second Annual Learning Conference: THE PARADOX OF CERTAINTY: NEW SCIENCE FOR TODAY'S BUSINESS LEADERS. April 14-16 Austin, TX.

The conference will focus on the applications of chaos & complexity concepts, psychology of curiosity & complexity, and new learning technologies to the development of learning and high performance business organizations and teams. Speakers include Ilya Prigogine, Fritjof Capra, Charles Spielberger and others. Attendance limited to 175. This is a multi-disciplinary conference that is designed to break new ground and will include many opportunities for active dialog between the speakers and participants. Cost is $1,895 per person ($1695 per person for businesses sending 3 or more individuals.)

Presenter Profiles Ilya Prigogine, Ph.D. -- Nobel Prize winner for his theories of complex systems and dissipative structures, the Director of the Ilya Prigogine Center for Studies in Statistical Mechanics and Complex Systems at The University of Texas at Austin, and the Director of the Solvay Institutes of Physics and Chemistry in Brussels. His books include *Order Out of Chaos, From Being to Becoming*, and, his most recent, *The End of Certainty*. Prigogine has had five institutes devoted to the study of complex systems named for him.

Fritjof Capra, Ph.D. -- An internationally renowned author and systems theorist, who since 1975 has presented new scientific concepts to general audiences. His books include *The Tao of Physics, The Turning Point, Uncommon Wisdom,* and *Belonging to the Universe* (with David Steindl-Rast), and his latest book, *The Web of Life*, which explores a new understanding of life through a shift from a mechanistic to an ecological paradigm. He also co-authored the screenplay for the feature film *Mindwalk* .

Charles Spielberger, Ph.D. -- Distinguished Research Professor and Dir ector, Center for Research in Behavioral Medicine and Health Psychology, at the University of South Florida. His research focuses on, among other things, anxiety, curiosity, and the experience, expression and control of anger; personality and learning; and job stress and stress manage-ment. He is President-elect of the International Association of Applied Psychology and Chair of the US National Committee of International Psychology of the national Academy of Sciences.

Martin Sage and Gigi Sage -- Chairman and Vice President, respectively, of The Results Group, and founders of Sage Productions, Inc. Chris Welsh -- President and founder of Mastery of Learning, an educational consulting company that produces the Mastery of Learning series of workshops. Dean Driebe, Ph.D. -- Research Associate in the Ilya Prigogine Center for Studies in Statistical Mechanics and Complex Systems at The University of Texas at Austin. Sam Zigrossi -- A dynamic futurist, speaker, educator, trainer, author and consultant focusing on the many dimensions of performance and the changes necessary to meet future business needs in a world driven by technological change.

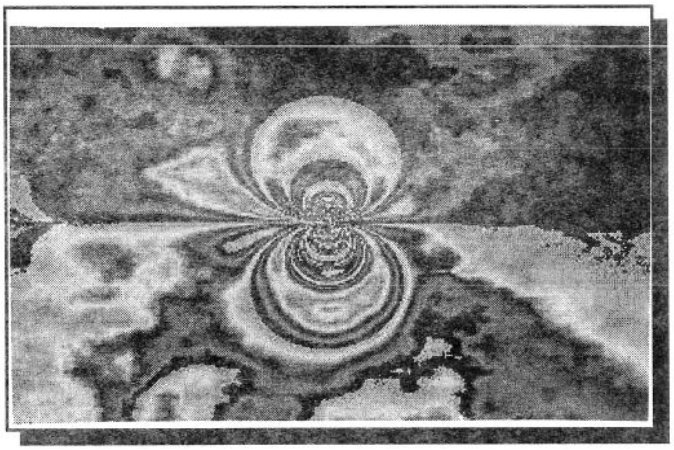
For Further information contact: Synthia Smith, synsmith@aol.com; (713) 621-5720 The Results Group: 5868 A-1 Westheimer, Suite 506, Houston, Texas 77057 or fax to 713.532.1723

XV SITGES EUROCONFERENCE : Statistical Mechanics of Biocomplexity. Universitat de Barcelona. Sitges, Barcelona, SPAIN, 8-12 June 1998

The conference will be centered on "Statistical Mechanics of Biocomplexity", with special emphasis on topics like: membranes, vesicles, microtubules, molecular motors, DNA, protein folding, phase transitions in biological systems, evolution, population dynamics, immunology, neural systems, biological oscillators.

Confirmed invited speakers: * D. Amit (University of Rome, Italy) "Extended mean-field theory for networks of spiking neurons;" * K. Dill (University of California, USA) "Partition Functions for RNA and Protein Molecules;" * S. A. Kauffman (Santa Fe Institite, USA) "Molecular Autonomous Agents: A new physical concept;" * Y. Kuramoto (Kyoto University, Japan) "Coupled biological oscillators;" * S. Leibler (Princeton University, USA) (to be specified); * R. Lipowsky (Max Planck, Germany) "Membranes / Thermal ratchets with disorder;" * J. Marko (University of Illinois at Chicago, USA) "Statistical Physics of Braided DNAs;" * A. S. Mikhailov (Max Planck, Germany) "Self-Organizing Molecular Networks;" * D. Nelson (Harvard University, USA) "Localization and population biology;" * L. Peliti (University of Naples, Italy) "Transitions in evolutionary models;" * J. Prost (Univ. Paris, France) "Examples of primitive motion mechanism in biological systems;" * T. Vicsek (Eotvos University, Hungary) "Dynamic phase transitions in systems of self-propelled objects: from rotating bacteria colonies to flocks of birds;" Additional Lecturers are being invited. The proceed-ings will be published by Springer Verlag in the series Lectures Notes in Physics. The number of participants is limited to 100.

Deadlines: Application for grants March 31, 1998; Registration April 15, 1998. Abstract submission : April 30, 1998. For further information contact: Prof. Miguel Rubi, Dept. Fisica Fonamental, Universitat de Barcelona, Av. Diagonal, 647, Barcelona 08028 SPAIN Tel. +34-3-402 11 62; Fax: +34-3-402 11 49; sitges@ffn.ub.es;http://www.ffn.ub.es/~sitges



GRADUATE SCHOOL PROGRAMS IN NONLINEAR DYNAMICS

We have received a number of requests on this forum for information about and recommendations for graduate programs in nonlinear dynamics and complexity. I think it's time to enrich our Chaos Society Web site with just such data. My plan is to list and briefly describe such programs and provide a link when available.

As a step in that direction I have searched the Chaopsych data base for relevant discussions (thanks to the search service - linked to our site, located at http://list.uvm.edu/cgi-bin/ wa?S1=chaopsyc) and accumulated the following programs (thanks largely to Fred Abraham), copied below without comment.

Boston University - Neural Computing - Stephen Grossberg
Boston University - Gail Carpenter
Brandeis University -
Florida Atlantic University - Program in Complex Systems and Brain Sciences, Center For Complex Systems- Scott Kelso
University of Connecticutt - The Center for the Ecological Study of Perception and Action- Michael Turvey
University of Texas at Arlington - Dan Levine
University of Melbourne - Jeff Pressing
Santa Fe Institute - http://www.santafe.edu/
University of Michigan, Program for the Study of Complex Systems- http://pscs.physics.lsa.umich.edu//pscs.html
University of Illinois at Urbana, Beckman Institute- http://www.beckman.uiuc.edu/research/reshome.html

I would appreciate your help making this list comprehensive. If you are familiar with any program listed below, please provide me with a two-sentence desription and url link, if available. If you know of another program that you recommend, please send the name, description, and url. You may send this information directly to me, if you wish, but it may be useful to send it to this list as others may wish to comment. *Many thanks, keith.n.clayton@vanderbilt.edu*

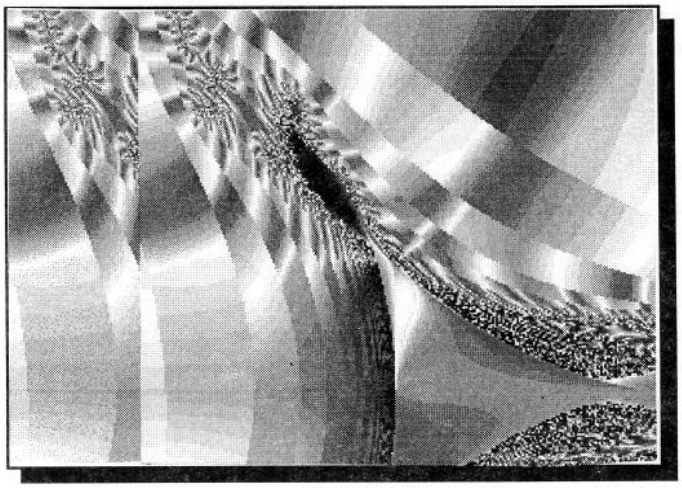
In the same vein, http://www.upd.unibe.ch /research /seminar.html are web pages giving an intro and literature recommendations in the context of a course for graduate students of clinical psychology. The topic is "Dynamics and Synergetics in Clinical Psychology". This course is being held at **Bern University**, so the material is largely in German. I am interested in others' experiences with webbased courses. Anybody teaching NLD in German? -- PD Dr. Wolfgang Tschacher, University of Bern, Psychiatric Services, Laupen-strasse 49, CH-3010 Bern, Switzerland. phone +41 31 3876164, fax +41 31 3829020.

Picture Credits this Issue: Fractal graphics appearing throughout this issue were composed by Dianne Miller. **Lobster in Rossler Sauce** was drawn by Robert Porter. **Boston Tea Party** first appeared in "A Pictorial History of the American Revolution" by R. Sears, printed in 1847.

The Best of CHAOPSYC

THE SANDPILES: AT HOME, AT WORK, and AT PLAY

Once again we present an edited discussion from CHAOPSYC. It was news when it happened (Dec, 1997).



From Gus: Students of complexity: I've been reading Kevin Dooley's and Andrew Van de Ven's paper, "A Primer on Diagnosing Dynamic Organizational Process," (an excellent primer by the way). A question came to mind about the difference between, let us say an organization reaching a bifurcation point on the Feigenbaum map and one experiencing punctuated equilibrium over time--that is it follows and inverse square law due to its behavior "consists of multiple, independent causes; and/or because the system has an aggregated behavior which depends on the simultaneous response of parallel relaxation processes." p. 19 It seems to be that at least two processes of emergence have been identified involving different morphogenic rules:

-- Work on organizations experiencing increasing stress suggests that as disorder increases in the environment and resources are used up more and more "errors" are made in coping efforts eventually leading to a bifurcation point, etc. Here the morphogenic process seems to be tied to increasing disorder.

-- Punctuated equilibrium, on the other hand, seems to imply the sudden emergence of new order out of a relatively ordered process of aggregating behaviors carried out simultaneously by parallel relaxation processes leading to self-organized criticality. In contrast, morphogenic processes seem to be tied to an orderly reworking that suddenly flips over.

The question is: Is there a difference? Are we looking at two different paths or maps to emergence?

From DDeBar: It sounds to me remarkably like the old "revolution v. reform" argument among socialists in the late 19th-early 20th century period. > *I've been reading Kevin Dooley's and Andrew Van de Ven's paper, "A Primer*

From Gus: > *It sounds to me remarkably like the old "revolution v. reform" argument* Up until this time on this list none of the various complexity theories did not seem to have an ideological bent. Most of social theoretical discussion has emphasized the deconstructionist implications, not touch much on more classical issues. Perhaps you could develop your observation more fully to see what this contribution might look like.

> > -- *Work on organizations experiencing increasing stress suggests that as[...] suddenly flips over.* There may be additional morphogenic rules here too. -- Annealing -- Spin-glass

> > *The question is: Is there a difference? Are we looking at two different* Or, is all of this really the same wine in different bottles? For example, there seem to be several different types of fractal processes (Vicsek, Fractal Growth Phenomena identifies many). If there is a difference here, then it would be useful to go through some sort of systematic classification showing differences and applications. Such insights could be relevant for social theory and throw light on issues such as that raised by deDebar. Such a classification could be the follow up to Kevin's paper.

From Ben: > > > -- *Work on organizations experiencing increasing stress suggests that as [...]suddenly flips over.* These are two different phenomena but I see them as coming out of the same underlying cause. Think about it in terms of wholes and parts, where a system is "holistic" to the extent that it has a higher ratio of

$$\frac{\text{emergent structure/dynamics}}{\text{size}}$$

than its parts. In your first example, we have the environment and the organization becoming decoupled, so that the environment-organization pair has decreasing holicity. When a part is released from a previously highly holistic system is it challenged to develop greater holicity on its own, or to find another greater holistic system to latch onto.

In your second example, we have a bunch of parts of an organism which previously have been relatively independent units, becoming more & more bound together, so that the collection of parts working together now has the high holicity rather than the parts. I.e., here is my maxim, in a slightly different language from the one I used in THE EVOLVING MIND: "living systems generally self-organize in such a way as to increases holicity."

Your second example is a straightforward application of the maxim; your first example shows that when holicity is decreased for whatever reason, the system acts to re-increase it in the least-effort possible way. that's my 2 cents, anyway :)

From Matthijs: << *A question came to mind about[...] parallel relaxation processes." p. 19 >> At first sight, strikes me very much as the same thing, but descriptions of different aspects of the dynamical process.* If the "aggregated behavior of the system depends on the simultaneous response of parallel relaxation processes", it seems to me that you are describing what happens near the bifurcation point. I should read the paper to make sure. What is the reference to Dooley & van de Ven?

From Gus: > *At first sight, strikes me very much as the same thing, but descriptions of.* Ben's point about a similar underlying process is important. But, if I understand what he is saying, he would agree that we are talking about two different avenues to emergence.

As I understand it, the first example involves an error making process due to environmental stresses that eventually leads to the disaggregation of the whole into parts that become available for new connections. The second, seems to involve a structure with parts that are working in parallel that suddenly give to rise to a new structure. The later does not seem to be an "error" making process as Feigenbaum would have it. The example that Dooley and Van de Ven gives is FDA regulatory control of new product entry into the market. Suddenly a regulatory decision is made after multiple parallel process and a new structure emerges--production and sale of the drug.

I'm interested in the difference because the "sand pile" approach and the regulatory discussion seems to point to a process of emergence that also leads to a bifurcation. In this case the regulatory FDA "map" order the process so that it looks like a "sand hill" that suddenly collapses. This is most interesting both from a strategy development viewpoint (how the future is constructed relative to sudden "slide" which affect the foresight horizon for example). This is quite different, it would seem, than when a sudden exterior shock hits an organization -- Asian economy -- which pushes it over the bifurcation point due to error making and lack of resources.

From Gus: *Ben: Thanks for your extensive comments. I would like to ask for some clarification. [snip] > than its parts I'm not certain that I understand the relationship between the holism of the parts and the environment. Could you briefly expand on this. > In your first example, we have the environment and the organization[...] > to latch onto.* Yes, I can see this. But, what if the part doesn't leave the organization? It seems to me that a new "dynamic" or form of interaction emerges beyond the bifurcation point. The new relationship is "invented" but one that is not characteristic of that at or going over the edge of chaos.

> *In your second example, we have a bunch of parts of an organism [snip] > reason, the system acts to re-increase it in the least-effort > possible way.* Yes, perhaps you answered my second question here. Do you think we are looking at a period doubling here as a new form of holism is sought out? Thanks again

From Ben: *Gus Koehler (gkoehler@library.ca.gov) wrote: > Ben: > Thanks for your extensive comments. I would like to ask for some > clarification.[...] > the parts and the environment. Could you briefly expand on this.* The system and environment are part of a larger meta-system. The breakdown of the relationship between system & environment is a matter of the parts of the metasystem becoming more autonomous, and the metasystem itself becoming less of a unified whole. Remember, where we divide the universe into system vs. environment is an arbitrary decision.

> > *In your first example, we have the environment and the organization[...] >The new relationship is "invented" > but one that is not characteristic of that at or going over the edge of > chaos.* OK, the part doesn't have to leave the organization in a physical sense, but the part leaves the organization in a pattern-theoretic sense: it no longer determines so much of its structure & behavior based on emergent patterns in the whole, but rather based on patterns manifested at its own level.

Imagine a marriage in which the two people are growing apart, becoming less of a unified whole. This doesn't have to split up the marriage, it can just result in each person becoming more of an individual whole systems, with a new, looser dynamic guiding the interaction. There may still be productive emergence on the couple level, but MORE emergence on the individual level.

> *Yes, perhaps you answered my second question here. Do you think we are > looking at a period doubling here as a new form of holism is sought out?* Period doubling is a special route to chaos that probably cannot be spoken of in the general context we are working in here. This is my intuition anyway. Different equations governing the quantitative processes underlying these qualitative shifts in emergence, could lead to different routes to chaos -- period doubling would be one example but almost definitely not the only one.

From Matthijs: *In a message dated 97-12-10 23:41:38 EST, Ben writes: << Imagine a marriage in which the two people are [snip] but MORE emergence on the individual level.* This is a textbook example of the difference between first order change and second order change. Becoming less unified but continuing to define your relationship in terms of marriage is an example of first order change, a variation in STATE 1 (being married), not involving bifurcations. Becoming less unified and then splitting up is second order change; it involves a qualitative transition from STATE 1 (marriage) to STATE 2 (not married), involving a bifurcation of attractors.

If I understand Ben and Gus correctly, one of the issues is that going from one whole to multiple parts is not the same as going from multiple parts to one whole (i.e., getting married and getting divorced are not similar processes). I would define both as second order change, and in that sense, there are important similarities in the underlying dynamics, including the possibility that incidental fluctuations can initiate second order change. Both would be examples of emergence.

An entirely different question is whether first and second order change are both examples of emergence. I guess that would depend on your definition of the term.

From Mark: *On Thu, 11 Dec 1997, MKoopmans wrote: >In a message dated 97-12-10 23:41:38 EST, Ben writes: >>< Imagine a marriage in which the two people are [snip] >This is a textbook example of [snip]* Couldn't we think of it just as easily as a change of degree rather than that of a change of kind. For example, these days the number of things that one can do to things that on owns (such as a house or car) is restricted by laws so that the difference of owning vs renting as we look at the different intensities from renting, coops, condos, to ownership we might think of all of them as different degrees of the same dimension.

From Matthijs: *In a message dated 97-12-11 14:17:51 EST, you write: >Couldn't we think of it just as easily as a change of*

Nonlinear Dynamical Book Reviews!

REVIEW of Physical Theory in Biology Foundations and Explorations, by Charles J Lumsden, Wendy A Brandts, and Lynn EH Trainor, eds. World Scientific 1997 ISBN 9810230826

Review by William Sulis, McMaster University.

There have been a number of books written in recent years on the subject of mathematical biology and on the application of physical methods to the study of biological systems. For the most part these texts have emphasized fairly conventional applications of fairly standard mathematical and physical tools and theory. Although I am overstating the point, many of these texts have not seriously addressed some of the more difficult, subtle, and ultimately interesting aspects of biology which distinguishes it as a science. In additon they have ignored some of the more exciting developments in theory arising from the burgeoning study of complex systems. The present work is an attempt to fill this gap and it is a welcome addition to the available literature.

The book is a collection of papers, some written by the editors, others solicited especially for this volume. All of the authors are experts in their respective fields and the topics covered span the range of modern biology. The book is divided into five sections: Foundations, Development (2 sections), Cellular and Organismic Biology, and Evolution.

The section on foundations begins with an article on the subject of `Emergence in Physics and Biology' by LEH Trainor. This is a central topic in the theory of complex systems and of considerable importance for understanding many of the more interesting questions in biology, especially as it relates to development and evolution. The next chapter, `Holism and Reduction', by C.J.Lumsden, was one of the most interesting in the book. Lumsden attempts to lay out a formal theory of reduction in physical theory, and in so doing addresses the important issue of irreducibility and the relationship between the various scientific disciplines. The approach is logical and categorical and leads to the idea of a layered statistical mechanics. The approach invokes ideas of averaging to explain the change in theoretical forms as one moves up the scale hierarchy. Fully developed, it offers the promise of a formal analysis of the effect of scale on theory.

`Complexity: A Pluralistic Approach' by WAM Brandts provides a general overview of the concept of complexity for a nonspecialist audience. `Dynamics, Complexity, and Computation' by PA Dufort and CJ Lumsden provides a detailed discussion of symbolic approaches to dynamics. All too frequently, dynamics is presented in terms of differential equations following the pattern of classical physics. Such an approach, while useful didactically, is woefully inadequate practically, since few systems in biology readily admit descriptions via differential equations. Most of the data from biological experiments, especially naturalistic and field studies, is discrete in nature, and seldom of sufficient accuracy to permit a differential model to be built. Instead, discrete approaches, and in particular, those based upon symbolic representations of dynamical systems offer a descriptive and analytical language which is more readily applicable to the laboratory setting. This chapter provides a detailed and thorough, yet accessible, discussion of models of dynamics based upon computational systems, beginning with a description of Turing machines, progressing through grammars, symbolic dynamics on to Crutchfield's epsilon-machines and Sulis machines. It thus takes the reader from fairly standard, though not necessarily well known literature, to the cutting edge of the field.

The first section on development focusses primarily upon issues of pattern formation. `Vector field models of morphogenesis' by WAM Brandts and J Totafurno introduces a gradient based model of morphogenesis and shows its applicability to the problem of limb regeneration. The next chapter `Symmetry breaking bifurcations' by TM Hart and LEH Trainor, nicely compliments the first by providing a demonstration that the production of supernummaries in a graft in the gradient based model results from the presence of a symmetry breaking bifurcation. In so doing the authors provide a striking illustration of the value of group theoretic methods to provide a qualitative analysis of the behavior of a dynamical system.

The second section on development focuses upon the principles of self organization. `Generic dynamics of morphogenesis' by B Goodwin discusses the search for generic patterns of behavior underlying morphogenesis. The search for generic behavior is important since it provides an overall `road map' for the study of large classes of complex systems, orienting oneself before embarking upon the detailed study of specific systems. `Toward a model of growth and form in living systems' by FW Cummings introduces the reader to the techniques of differential geometry, another powerful tool for extracting qualitative information from a dynamical system.

`Living organization, the coherence of organisms and the morphogenetic field' by MW Ho, YM Zhiu, and J Haffegee was another unique and intriguing article. Here the authors discuss the concept of coherence as a fundamental aspect of the organism. They define coherence as a collective mode of activity, coupled together, and existing over all spatiotemporal domains. They argue for a role for quantum coherence in the dynamics of organisms and provide an fascinating description of some of the relationships between electromagnetic fields and morphogenesis. Finally, `Is spatial pattern formation homologous in unicellular and multicellular organisms' by J Frankel, discusses the role of homology versus analogy in pattern formation.

The section on cellular and organismic biology introduces the reader to a variety of techniques rooted within the field of statistical mechanics in physics. FP Jones and P Tevlin provide a fairly straightforward application in `Statistical mechanics of the main phase transition in lipid bilayers'. Hopfield style neural networks are applied in the next three articles: `Multi neuron interactions in neural network models of

(CONTINUED ON P.)

A Review of Self-Organization of Complex Systems: From Individual to Collective Dynamics, Frank Schweitzer, Ed. 1997Gordon & Breech.

Reviewed by Elliott Middleton, Department of Finance, Metropolitan State University

A collected proceedings is like an X-ray crystallography. From the refraction patterns of the individual papers the reader is invited to infer the intellectual excitement of the event itself. This book consists of a selection of papers that were presented at the international conference "Self-Organization of Complex Structures: From Individual to Collective Dynamics," held in Berlin 24-28 September 1995. The conference attracted some 150 scientists from 15 countries. During the five days, 18 plenary talks, 34 talks in parallel sessions and 40 poster contributions were presented.

The Berlin conference continued the conference series, "Irreversible Processes and Self-Organization," begun in Rostok in 1977, continued in Berlin 1982, Kuhlungsborn 1985, and Rostok 1989; and "Models of Self-Organization and Complex Systems," Berlin 1990. The conference was similar to another, "From Individual to Collective Behavior in Social Insects," which was devoted to specific problems of organization in bee societies. Other recent conferences dealing with self-organization and complexity have concentrated on physical problems or the problems of artificial life. In contrast, the Berlin conference, as reflected in these proceedings, attempted to link the discussion of complex processes in the natural sciences, in particular physics and biology, to those in the life sciences, such as sociology, economics, or regional planning. The primary challenge was to reveal cross-links between the dynamic models used in these fields in order to find similarities upon which to base a common theory of self-organization and evolution of complexity.

The proceedings are divided into two parts, "Evolution of Complexity and Evolutionary Optimization," and "Biological and Ecological Dynamics, Socio-Economic Processes, Urban Structure Formation and Traffic Dynamics."

The first subsection of Part I is the "Evolution of Complexity." This section included papers largely by physicists at the highest levels of abstraction, both mathematical and philosophical. F.T. Arecchi attacked the problem of "Truth and Certitude in the Scientific Language," in a Popperian fashion, drawing upon the author's own published work in physics in adaptive measurement of dynamic systems, coming to the conclusion that "there is a non-linguisitic residue in the scientific operation which then precludes a Turing machine from acting as a creative scientist." J.S. Shiner, in "Self-Organization, Entropy and Order in Growing Systems," relates the normalized Landsberg entropy measure to Kaufman's NK networks in an informative discussion. Normalizing the measure by the maximum possible entropy of the system avoids the nonsensical result that larger systems (e.g., animals) are more entropic and less ordered than smaller ones, according to simple Shannon-Weaver entropy.

"Inherent Information Flow in Chaotic Systems," by G. Deco and B. Schurmann, proves that "A system can lose permanently information only if it has infinite information, and this is the case for deterministic chaos. In other words, the memory of the process is infinite." This startling proof goes against what I am guessing is the fairly widespread intuition of a chaotic process as a memoryless "random walk" of some variety.

"Information Processing in Evolutionary Systems," by N. Fenzl and W. Hofkirchner, reminds us that there is no information without some "self-organizing structure," which reflects a blurring of the subject-object dichotomoy.

The remaining papers in this subsection were produced using large amounts of CPU time: "A Note on Simulation and Dynamical Hierarchies," S. Rasmussen, N.A. Baas, C.L. Barnett and M.W. Olesen; "Fractal Evolution in Discretized Systems," S. Fussy, G. Grossing and H. Schwabl; "Interactive Structure Formation with Brownian Particles," L. Schimansky-Geier, F. Schweitzer and M. Mieth; "Fluctuation and Phase Space Structures of Agent-Resource Systems," I. Adjali; "Self-Organization of a Multi-Agent System in Pattern Formation." The titles describe the simulations performed.

The second subsection of Part I on "Evolutionary Optimization" begins with a paper by B. Andresen on "Global Opimization Using Ensembles," or the use of multiple walkers in establishing global convergence on a complicated manifold or state-space. Examples of ensembles include simulated annealing, genetic algorithms, and neural networks.

"Mixing of Thermodynamical and Biological Strategies in Optimization," by T. Asselmeyer and W. Ebeling, compares "brute force" thermodynamical search strategies with more flexible "biological" strategies. A mix is to be preferred. "Combinatorial Optimization Based on the Principles of Competing Processes," by J. Starke, explores the method of cost-oriented competing processes as a way of handling combinatorial optimization problems in a self-organizing manner. The advantage of this process compared to other parallel-processing approaches like Hopfield networks is that only valid solutions become outputs. "Explorations of Artificial Landscapes Based on Random Graphs," S. Kopp, C. Reidys, and P. Schuster, attacks highly specialized issues in the modeling of secondary structures in RNA.

The most provocatively-titled paper, by F.M. Dittes, "How Egoism Helps to Solve Global Problems," proposes a new optimization strategy for problems with many competing requirements, based on the simultaneous optimization of the standard objective function as well as of objective functions for the individual sites forming it, with a weight function realizing a balance between interests of different scales. The algorithm performs well in simulations. As an economist, I have to wonder where the weighting function is going to come from, however, if we're really talking about solving global problems.

"Frustration and Clustering in Biological Networks," by H. Bersini, explores the tendency of many different kinds of networks, ecological, Boolean, Hopfield, neural networks and others, to form self-organizing oscillatory clusters, and addresses the issue of optimality of such clustering. "Cortical Functionality Emergence," by H.-O. Carmesin, models the emergence of cortical functions from generalized networks. "Emergence of Functionality and Biological Clock in 'Fast' Proteins," W. Klonowski, advances the negentropic hypothesis that some very short-lived proteins' usefulness is in fact determined by their limited lifetimes, as these proteins are the products of disequilibrium states and are designed to reach extinction when the cell reaches equilibrium.

Part II begins with the subsection "Biological and Ecological Dynamics." E. Ben-Jacob and I. Cohen explore the fractal growth and response patterns of bacterial colonies to different environmental conditions. "Self-Regulation of Plants," by K.-W. Wirtz examines optimization of leaf area under different soil nitrogen concentrations for a population of birch trees.

"Aperiodic Patterns in the Cell-Nutrient Substrate System," A.B. Medvinsky et al., explores using a cellular automata approach to the origin of spatial structures resulting from a combination of diffusion and local kinetics; following in the tradition of Turing's solution to this problem. A similar approach is taken by D. Drasdo in "Different Growth Regimes Found in a Monte Carlo Model of Growing Tissue Cell Population." In this case stochastic local interaction rules are specified for a lattice model, which is able to reproduce observed characteristics of growing tissue cell populations.

"Classification of Terrestrial Ecosystems with Complexity Measures," H. Lange, M. Hauhs and C. Romahn, uses symbolic dynamics representations of ecosystems to generate measures of metric entropy and metric complexity. In this view an ecosystem acts as a filter in its abiotic environment by extracting information from irreversible input fluxes. Not surprisingly, the reconstruction of finite state machines from observed precipitation and run-off data for two well-documented ecosystems failed.

"Temporal Self-Organization in Generic Ecosystem Models," M. Bussenschutt and C. Pahl-Wostl, performed a number of ecosystem simulations. I.M. Janosi and I. Scheuring, in "Possible Role of Mobility in Natural Selection," show that in simulations a mobile species is able to squeeze out less mobile competitors from an entire lattice of connected local habitats, as often observed in world history. E. Steffen and H. Malchow, "Chaotic Dynamics in a Simulation Model of a Plankton Community," is also based on Turing's nonequilibrium reaction-diffusion patterns in biomorphogenesis. This model includes phyto- and zooplankton biomasses, a nutrient level, predation by fish, growth rates, grazing rates, a competition coefficient, respiration and mortality rates.

The second subsection of the second part, "Dynamics of Socio-Economics Processes," is probably of special interest to readers of this journal. "Self-Organization in Social Systems: The Process of Integration," begins with a qualitative review of the importance of information in nature and social life. H.C. Harton and B. Latane explore the dynamics of cultural self-organization as a cultural "game of life," with local interaction rules of clustering, correlation, consolidation, and continuing diversity, all without once using the word "meme." Latane's social impact model is extended by K. Kacperski and J.A. Holyst in a cellular automata model of opinion clustering around a leader in cases of external impact on the group. Parameters included the strength of the leader and the "social temperature."

T. Brenner simulates the "VID" (variation-imitation-decision) model to describe the interaction between decision makers when exchanging information. Brenner makes the unfortunate assumption that decision makers have no social influence on each other, leaving the results with a singular lack of credibility. F. Liebl writes on the management of strategic issues by corporations, which he defines as "discontinuities in the (social-psychological) environment." This paper, one of the few non-mathematical papers in the volume, reads like a *Harvard Business Review* article, and can be summarized as giving the following advice to management: "Remain aware of your surroundings and be flexible."

W. Ebeling reviews the now-familiar envelop function of development dynamics. This paper reminds us that some of the empirical regularities that emerge from a dynamic systems perspective, such as life cycles of products and firms, or the strong correlations of firm growth rates with size across industries, are extremely powerful and are not derivable from classical or neoclassical economic theory.

G. Silverberg, "Is there Evolution after Economics?" reviews similar results in evolutionary economics in a simulation model with "boundedly rational" agents which reproduces some of these effects. M. Grothe, makes the unsupported assertion that the degree of coordination of a socio-economic system is a function of the degree of long-run competitiveness and short-run cooperativeness of agents.

T.C. Dandridge and B. Johannisson make some general remarks about self-organization among business establishments, in different larger contexts such as business incubators, franchising systems, cooperatives, science parks, and so on. V. Ahrens discusses planning and control in self-organized production systems, without a mathematical model or empirical results. S. Guriev and M. Shakhova consider "Self-Organization of Trade Networks in an Economy with Imperfect Infrastructure," in a model with consumers, producers, and traders acting in a distributed model for a homogeneous good. While infrastructure is a concern in Russia currently, this paper is too abstract to provide useful policy guidelines.

The last subsection of Part II, "Urban Structure Formation and Traffic Dynamics," begins with a "sim-city"-type paper by W. Weidlich, "From Fast to Slow Structures in the Evolution of Urban and Regional Settlement Structures," which establishes the usefulness of the "slaving principle," when fast processes take place on the local micro level of building sties, where the local traffic infrastructure of streets and subways is constructed, while slow processes take place on the regional macro level, including the slow evolution of whole settlements, like villages, towns and cities, which can be considered as population agglomerations of different size, density and

composition. The reader is presented with a beautiful assortment of 3-D topologies created by the simulations. However, until "dynamical empirical regularities" can be established in some large data sets, these results are less than compelling. The same remark can be applied to "Regional Dynamic Processes in the Economy," by K. Brandt.

F. Schweitzer and J. Steinbrink, in "Urban Cluster Growth: Analysis and Computer Simulations of Urban Aggregations," do attempt to model stylized empirical facts of urban agglomerations using a reaction-diffusion approach. Both empirically and in simulation, the rank-size distribution of urban clusters approaches a power law. It is comforting to see simulation results compared with empirical results.

R. White and G. Engelen perhaps go the furthest toward integrating regional economics with the sciences of chaos and complexity in "Multi-Scale Spatial Modeling of Self-Organizing Urban Systems," This article surveys the "sim-city" cellular automata approach to urban modeling, with a nice discussion of the parallels to the "edge of chaos" and fractals. In this paper I read the most compelling rationale for the use of the term "fractal" in describing human organizations, namely, that in this sense the self-organizing system or organization contains a model of itself at some scale, which may be--probably is--erroneous to some degree.

J. Portugali and I. Benenson explore the effects of local and global forces in a self-organizing city, with particular attention to the interaction of members of different ethnic or racial groups. Given somewhat hopeful assumptions about the long-run ability of members of different groups to form a "common culture," the authors find that, in simulations, early tendencies toward segregation give way in the long run to "neutrals," and presumably, peace.

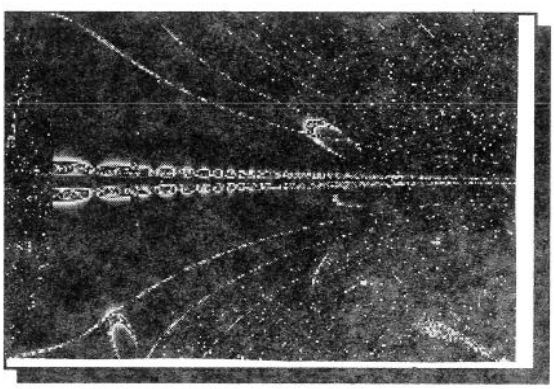
J. Lobo and R.E. Schuler consider the straight-forward economics question: "In a random environment, is there an optimal number of cooperating elements that results, on average, in maximum group output?" However, as they assume minimal structure and no foresight on the part of the elements (i.e., a one-period memory) their model of a "trial-and-error economy" is unrealistic and derivatively related to Kaufmann's NK networks.

J. Kropp and G. Petschel-Held apply Kohenen self-organizing feature maps to the reduction of dimensionality of descriptors of German cities, showing that a 34-dimensional data array can be mapped into a 4-dimensional subspace with minimal topological distorion by Kohenen's learning neural network method. The authors suggest that, "with the implementation of valuable databases," the method offers a promising road toward qualitative description and prototyping of complex systems.

"Self-Organization Phenomena in Pedestrian Crowds," by D. Helbing and P. Molnar, joins the raft of papers on queuing and swarming, implementing simulation models of pedestrians at intersections and passing through narrow passages, and comes to the following conclusions: lanes develop of pedestrians who walk in the same direction; the walking direction at narrow passages undergoes oscillatory change; and roundabout traffic forms spontaneously at crossings. These self-organized patterns arise from nonlinear interactions of pedestrians following a simple social force model at the individual level. While the authors do not present empirical support for these findings, they ring so true to experience as to be unassailable.

K. Nagel, S. Rasmussen and C.L. Barrett, "Network Traffic as Self-Organized Critical Phenomena," reach the paradoxical conclusion as a result of their simulations of the collective behavior of "simple adaptive agents," that traffic management, while it may indeed make traffic more efficient, may also make traffic more variable and unpredictable, by driving the system closer to capacity and "self-organized criticality." The introduction of a traffic management system can actually produce a more unpredictable traffic dynamics. The authors write that this happens because the traffic management system moves traffic from more congested to less congested roads and thus as a whole forces the transportation system into the critical regime where small perturbations have a large influence on the microscopic dynamics. At lower traffic densities, variations of travel time are maximized, flow is maximized, but travel time is near minimal levels. Since air pollution as well as serious accidents are maximal where acceleration and deceleration are maximal, the critical regime, in addition to its non-controllability, produces other highly undesirable side effects.

While not quite an *Ur*-document on the order of some of the early Santa Fe proceedings, "Self-Organization of Complex Structures" is a valuable proceedings volume. It accomplishes its purpose of bringing together multiple perspectives and making the reader draw inferences about commonalities. Most of the work is by physicists and is at a high level of mathematical and computational sophistication. It is perhaps reasonable to quibble that many of the papers produce yet another virutoso simulation, without reference to empirical results. A few papers compared simulation results with empirical results; and indeed, a new standard seems to be emerging that this be done of any simulation. In this way, researchers may indeed be led to meaningful generalities linking classes of generating structures and the output distributions they produce. Science requires the formulation and testing of falsifiable hypotheses. Making one's favorite assumptions about agent behaviors, and then embedding them in a simulation model which exists apart from the real world, is not much different from the enervating practices of mathematical economics and psychology, where assumptions are made and results "proved" about economic systems or human psychology. The sciences of complexity would be well-advised to avoid this pitfall.



Review of Mason & Dixon, by Thomas Pynchon, Henry Holt and Company, New York, 1997, 773 pages, $27.50 cloth, ISBN 0-8050-3758-6.

Review by J. Barkley Rosser, Jr., Department of Economics, James Madison University

"Snow-Balls have flown their Arcs, starr'd the Sides of Outbuildings..." begins Thomas Pynchon's new novel, Mason & Dixon, subtly referencing both his previous masterpiece, Gravity's Rainbow, and his astronomical theme that could be labeled "Newton and his Discontents," as well as presenting the eighteenth century form and style in which the novel is written. Apparently long in the writing, this book is a worthy companion to the earlier masterpiece, matching it in scale, breadth, and depth more than any other of Pynchon's works. If it is a bit less insanely original, it is more carefully constructed than its predecessor.

Multi-layered and multi-themed, the ostensible plot of the book is about the adventures of the actual historical personages, Charles Mason and Jeremiah Dixon, astronomer and surveyor respectively, from their meeting in the early 1760s through their deaths, the elder Mason passing on in 1786. Their most significant activity, occupying the largest portion of the book, was the drawing of the boundary line that bears their names between Pennsylvania and Maryland in the mid-1760s, although the first 250 plus pages cover their observation of the Transit of Venus from the Cape of Good Hope and some other activities prior to that.

As with Gravity's Rainbow and to a lesser extent his first novel, V., Pynchon provides a deep foundation of historical accuracy which shades without clear boundary into the fantastic and the surrealistic. Obviously created items include a talking dog ("Learnèd English Dog"), an erotic robot duck that pursues a French chef across the Atlantic, a golem lurking near a tavern run by kabbalistic Jews named "The Rabbi of Prague" in the wilderness near the Allegheny mountains, and a Jesuit telegraph system operating across the globe via balloons and parabolic mirrors. But then an odd character named Thomas Cresap who recounts to them invading Pennsylvania from Maryland to armed resistance turns out to be historical. An account of Mason and Dixon smoking "Indian hemp" with George Washington becomes less fanciful (if still utterly hilarious) when one realizes that Washington's agricultural notebooks describe how to distinguish male from female plants, there being no other known reason for doing so than if one wishes to consume parts of the female plants for their psychotropic effects.

This would appear to be Pynchon's candidate for "The Great American Novel," albeit probably too dense and complex for being taught in high school courses, thus unlikely to replace Huckleberry Finn. Like the latter, numerous wild characters appear along the drawing of their famous line, as they do while Huck and Jim float down the Mississippi, another great boundary in American life and history. Also, it ends with young characters setting off into the West, in this case Mason's elder sons "to fish" after his death in Philadelphia in the presence of Benjamin Franklin.

In its recounting of pre-revolutionary America, it digs into the dark soul of American history, dealing with such appropriate subjects as the role of the exploitation of African American slaves in the building of the new nation (the Mason-Dixon Line dividing the free North from the slave South) and the massacres of Native American Indians as the western frontier is opened to European settlement. Ironically, Dixon, from whose name "Dixie" has inaccurately thought to have been derived, the nickname of the Old South, is presented as passionately anti-slavery.

One of the most persistent and profound themes running through the novel is that of Newtonian linearity and order versus romantic nonlinearity and chaos. At one level this shows up in the depiction of Mason's character. He is seen as simultaneously the true deistic follower of Newton and lead astronomer of the pair, imposing order on the land with his astronomical measurements, while also being obsessed with his dead wife, thus constantly pursuing her in dreams and graveyards and otherwise exhibiting a Gothically romantic sensibility.

At its most obvious this conflict involves the very drawing of the Mason-Dixon Line itself. Mason debates this with a Chinese feng shui master, Captain Zhang, who argues that the straight line they are drawing, derived from Roman models and representing the imposition of law and order, violates the spirit of the land, the dragon beneath the soil. Boundaries should follow rivers or ridge lines, nonlinear surfaces. Their star-based straight line will generate sha, evil energy that obviously will manifest itself in the slaughter of the Civil War, as well as the further slaughters of the westward expansion. But Mason and Dixon remain the true servants of their Age of Reason and its linear Newtonian Enlightenment.

Although this is largely framed in a static form, linear versus nonlinear boundaries, Pynchon also introduces the theme of entropy, an old favorite of his. In this case it appears in the form of a clock that does not need to be wound and does not stop that is given to the fallen-away Quaker, Dixon, by a Jesuit mentor of his (conflict between French Jesuits and the masonic British East India Company, with which Mason is connected, is another theme of the book). Dixon becomes obsessed with it until another character swallows it, whose wife abandons him because of its ticking. Pynchon's sense of humor remains intact throughout.

But the sense of order versus chaos, and its association with the European settlement is summarized in a mock poetic bit near the end of the novel. Throughout he has poetic fragments from a Tom Tox, alleged author of The Pennsylvaniad, a clear mock of Alexander Pope's Dunciad. As Pope declaimed regarding chaos and anarchy, so Tox declares:

"At Penn's Ascension of the Delaware,
Savages from the banks covertly stare,
As at the Advent of some puissant Prince,
Before whom, Chaos reign'd, and Order since..."

The reference to the Delaware is appropriate given that Mason and Dixon's drawing of their line west is brought to a halt by an encounter with a Delaware chieftain carrying a white man's scalp and the white man's gun engraved with Satanic devices. As much as anything, this gives the flavor of this brilliant and provoking book.

REVIEW OF Lumsden et al., continued:

associative memory' by AE Busch and LEH Trainor, Network hierarchies in neural organization, development and pathology' by JP Sutton, and `Category switching - a neural network approach' by LEH Trainor, WAM Brandts, and JL Torres. That latter was particulaly interesting for its application to the problem of task allocation in social insect colonies, particularly the desert dwelling ant Pogonomyrmex barbatus.

Finally, no book on modern biology is complete without a section on evolution and this book is no exception. Again, the methods discussed are eclectic, from the use of the maximum information principle in `A model of molecular evolution based on the statistical analysis of nucleotide sequences' by L Luo, to neural network based cluster analysis in `Codon space: exploring the origins and development of the genetic code' by LEH Trainor, GWA Rowe and GJ Nelson, through `Evolution of development: the shuffling of ancient modules by ubiquitous bureaucracies' by EW Larsen, and ending with an introduction to `Game theory in biology' by GWA Rowe.

The authors admirably achieve their stated goal which is to expose the reader to a broad sampling of some of the more innovative and exciting ideas beginning to emerge from the interaction between the physical sciences and biology. They clearly demonstrate that a mutually beneficial interchange of methods and ideas is to be had for those willing to take the time to step outside of one's normal discipline. This book deserves to be on the shelf of everyone interested in the formal analysis of biological questions.

Best of CHAOPSYC, continued

degree rather than that of a change of kind. Perhaps you can, but it does not come with a tremendous amount of ease as far as I'm concerned. Most couples attest to the turbulent nature of the transition to divorce, and to the significance of the qualitative nature of the transition to marriage. If a couple has been together for a long time, and then decides to marry, then yes, that would perhaps be first order change. I guess my main point is that sometimes changes are gradual, and sometimes they are not, and that the dynamics in those two cases are different. Wholly apart from this, changes can be of a differentiating or integrative nature.

From Matthijs: *In a message dated 97-12-11 22:01:07 EST, Gus Koehler writes: << The smaller changes and adjustments that Ben is [snip] system but it is still the "same" marriage.* Yes, in which case second order change takes place in the dynamical system, and first order change in the marriage. Some people in the family process field have dealt with this issue by making a distinction between role structure (your dynamical system, the spouses who change their way of being married), and relational structure (the marriage itself in your example).

From Mark: *On Fri, 12 Dec 1997, MKoopmans wrote: [snip] >structure (your dynamical system, the spouses who change their way of being >married), and relational structure (the marriage itself in your example).* This is a very important point that keeps coming up constantly in discussions of this type. I did write some time ago that I was "volunteering" to write a tutorial article on these matters. How would one go about asking a "journal for the social scientists" if the said journal would be interested in a tutorial article which will relate these concepts to nonlinear dynamics :-)

From Gus: *On Thu, 11 Dec 1997, MKoopmans wrote: [snip] > involving a bifurcation of attractors.* To me the movement toward the break is more characteristic of going over the edge of chaos. The smaller changes and adjustments that Ben is talking about seem to imply to interactive processes within a given structure which may in fact change the marriage into an altered dynamical system but it is still the "same" marriage. For example, a study a few years ago looked at dysfunctional family verbal interactions and, using catastrophe theory, found that a cusp formed when they passed into the dysfunction state (sorry not site immediately available). The family form continued but the pattern changed.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation has just announced a new grant competition in the area of "Knowledge and Distributed Intelligence" (KDI) Social scientists who use advanced computing and communications technology in their research, or who study the development and impacts of this technology, should consider submitting research proposals. Approximately $50 million will be available for KDI in fiscal year 1998. A second KDI competition will be held in fiscal year 1999, subject to availability of funds. Two submission deadlines have been set so far: May 8, 1998 and February 1, 1999. Details about the announcement can be found in the Crosscutting Programs portion of NSF's main homepage: http://www.nsf.gov/ or http://www.nsf.gov/home /crssprgm /start.htm.

"The recent growth in computer power and connectivity has changed the face of science and engineering. The future promises continued acceleration of these changes. The challenge today is to build upon the fruits of this revolution.

"This rise in power, connectivity, content, and flexibility is so fundamental that it is dramatically reshaping relationships among people and organizations, and quickly transforming our processes of discovery, learning, exploration, cooperation, and communication. It permits us to study vastly more complex systems than was hitherto possible and provides a foundation for rapid advances in understanding of learning and intelligent behavior in living and engineered systems. Today's challenge is to realize the full potential of these new resources and institutional transformations.

"Knowledge and Distributed Intelligence (KDI) is a Foundation-wide effort designed to catalyze this next step." *Note: Be sure to consult NSF sources for application rules and procedures. This program requires a Letter of Intent before filing the actual proposal.*

Nonlinear Dynamical Bookshelf

Studies on Nonlinear Phenomena in Life Sciences Vol. 6

THE COMPLEX MATTERS OF THE MIND

Edited by Franco F. Orsucci (Rome International University & Institute for Complexity Studies, Rome) 300 pp. (approx) - Pub. Date: Spring 1998 World Scientific Publishing Co. Ltd. 57 Shelton St., Covent Garden, London WC2H 9HE, UK Fax: 44-171-836-2020 Tel: 44-171-836-0888 E-mail: sales@wspc.demon.co.uk

This book focuses on the successes and difficulties of nonlinear studies, particularly in the areas of Mind Sciences. It attempts to answer th following questions: is an interdisciplinary contam-ination of complexity studies in different disciplines useful ? Does this contamination originate in a transdisciplinary toolbox of methods and models which is worth calling Nonlinear Science? What are the relations between the metaphoric approach and the mathematics approach in natural sciences and humanities ? Complexity in the Life Sciences represents a fundamental workbench for these kinds of problems. The most fascinating challenge in these areas is represented by studies on mind functioning.

Contents: Introduction (F. Orsucci); Foreword (W.J. Freeman); Complexity in Science: Syntaxes versus Semantics (F.T. Arecchi); Chaos and Complexity in Physics (L. Pietronero); Dynamical Systems in Psychology: Linguistic Approaches (W. Sulis); Nonlinear Dynamics in Language and Psychobiological Interactions (F. Orsucci); Minimal Models for Dyadic Processes: A Review (S. Rinaldi & A. Gragnani); Fractal Dynamics in the Human Body. Heartbeat Interval Fluctuations in Health and Disease (M. Meyer et al); Episthemological and Treatment Implications of Nonlinear Dynamics (A.H. Stein); The Six Fundamental Characteristics of Chaos and Their Clinical Relevance for Psychiatry: A New Hypothesis on the Origin of Psychosis (G.B. Schmid); Social Anthropological Considerations on the Predictability and Unpredictably of Community Outcomes (G. O. Smith); Models Portability: Some Considerations about Transdisciplinary Approaches (A. Giuliani).

Note: The choice of books and detail of listings greatly depend on what the authors or other interested parties care to send us. If you wrote a new book, please send descriptive info to the ***SCTPLS Newsletter*** Editor. Thank you. -WS.

CHAOS EXPANDS

I want to draw attention to some new publications which are appearing just now. I want to emphasise that what is meant by chaotic systems is being broadened and deepened by these new studies, and social scientists will need to keep up with where the subject is going if they are not eventually to end up in a backwater of ideas. *--Robert Gregson*

Nonlinear dynamics and chaotic phenomena: An introduction by B.K. Shivamoggi Uni of Central Florida published by Kluwer, 1997, 420 pp ISBN 0-7923-5772-2 This book has grown out of the author's lectures on nonlinear dynamics for graduates.

Introduction to Chaos by H. Nagashima and Y. Baba, Shizuoka Uni Japan publisher Institute of Physics July 1998, 250 pp ISBN 0-7503-0507-X A basic introduction to chaos.

Chaos in Hamiltonian Systems by G. M. Zaslavsky New York Univ. publisher World Scientific 1997 circa 250 pp ISBN 981-02-3104-0 This is important, and Zaslavsky is already know for creating one of the key attractors in the subject.

Nonlinear Dynamics and Chaos by H.T. Moon, S. Kim and Behringer publ World Scientific Series on Nonlinear Science Series B 1997 circa 250 pp.ISBN 981-02-3143-1 A unified picture of recent progress in diverse interdisciplinary problems.

Introduction to Random Chaos, by Szulga, J. (Dept. of Maths, Auburn Univ 304pp approx March 1998 hardback ISBN 0-412-05091-9 Chapman and Hall.

Dynamical Systems (vol 1) and Disordered Systems (vol 2), Edited by Bamon, R., Gambaudo, J-M., and Martinez, S. It is in English but published in Paris by Hermann Editeurs des Sciences et des Arts Collection Travaux en Cours volumes 52 and 53. ISBN numbers ISBN 2 7056 6288 X and ISBN 2 7056 6289 X. The first volume has as keywords Dynamical systems, bifurcations, chaos, normal forms, ergodic theory, and the second volume has metastability, probability, neural networks. The editors are. and I recommend it as an introduction to the relevant mathematics, which is rigorous bur clearer than some other work I have seen. The whole two volume work grew out of a series of lectures at a UNESCO summer school. This work has only just arived in Australia but has as its copyright publication date 1996.

IN SOCIOLOGY

Chaos, Criminology and Social Justice: TheNew Orderly (Dis)Order by Dragan Milovanovic (Ed.) (1997). Westport, CT: Praeger Publishers. Paperback,$24.95. Pp.221.

Contents: Introduction - Dragan Milovanovic I. Chaos Theory: Conceptual Contributions to a Postmodern Criminology and Law 1. Postmodernist versus the Modernist Paradigm: Conceptual Differences -Dragan Milovanovic 2. Challenges: For a Postmodern Criminology - T.R. Young II. Chaos, Criminology and Law: Critical Applications 3. chaos and Modeling Crime: Quinney's Class, State and Crime - Allison Forker 4. The ABCs of Crime: Attractors, Bifurcations, and Chaotic Dynamics - T.R.Young 5. Geometric Forms of Violence - Hal Pepinsky 6. Law and Social Change: The Implications of Chaos Theory in Understandingthe role of the American Legal System - Glenna Simons and Willima F. Stroup 7. Chaos, Law, and Critical Legal Studies: Mapping the Terrain -- CarenSchulman 8. The Chaotic Law of Feorensic Psychology: The Postmodern Case of the(In)Sane Defendant - Bruce Arrigo III. Chaos Theory, Social Justice, and Social Change 9. Surfing the Chaotic: A Non-Linear Articulation of Social Movement Theory-- Robert Schehr 10. Dimensions of social Justice in an SRO (Single Room Occupancy):Contributions from Chaos Theory, Policy, and Practice - Bruce Arrigo 11. Visions of the Emerging Orderly (Dis)Order - Dragan Milovanovic.

Two recent articles "lay out chaos theory, a possible integration with psychoanalytic semiotics, and anapplication to law and criminology:"

Dragan Milovanovic (1996), 'Rebellious Lawyering': Lacan, Chaos, and the Development of Alternative Juridico-Semiotic Forms. *Legal Studies Forum20*(3): 295-321.

Dragan Milovanovic (1996), Postmodern Criminology: Mapping the Terrain,*Justice Quarterly 13*(4): 567-610.

Chaos, Complexity and Sociology: Myths, Models, and Theories. Edited by Raymond A. Eve, Sara Horsfall, and Mary E. Lee (1997). Thousand Oaks, CA: Sage. 324pp +xxxv

Contents: F. Turner: Forward. Eve et al: Preface. B. Price: Myth of postmodern science. M. E. Lee: From enlightenment to chaos: Toward nonmodern social theory. K. Mihata: The persistence of "emergence." K. W. Back: Chaos and complexity: Necessary myths. T. S. Smith: Nonlinear dynamics and the micro-macro bridge. E. Elliott & L. D. Kiel: Nonlinear dynamics, complexity and public policy: Use, misuse, and applicability. H. M. Staubman: Self-organization of the economy: A system-theoretical reconsideration of Georg Simmel's *Philosophy of Money*. W. S. Bainbridge: The omicron point: Sociological application of the anthropic theory. W. F. Stroup, II: Web of chaos: Implications for research design. R. J. Bird: Chaos and social reality: An emergent perspective. B. Goertzel: Chaos and pattern in complex systems. K. M. Carley: Organizations and constraint-based adaptation. K. Dooley, P. Hamilton, M. Cherri, B. West, and P. Fisher: Chaotic behavior in society: Adolescent childbearing in Texas 1964-1990. R. A. Eve: Afterward: So where are we now? A final word. Indexes.

From the AMERICAN PSYCHOLOGICAL ASSOC.

Tobi Zausner's painting, Advice to the Imperfect, appeared on the front cover of the March, 1998, issue of the American Psychologist. Tobi was one of the co-designed of the Fractal Planets poster that served as a moniker for the 1997 SCTPLS conference in Milwaukee. AP has a circulation in excess of 110,000.

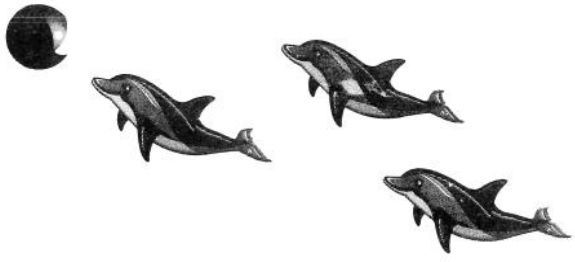
SCTPLS WORLDWIDE

BAVARIA, GERMANY. The 7th Herbstacademy conference: Self-Organization in Psychology, Psychiatry, and Social Sciences will be held at the Centre for Education and Cultural Events, Seeon Monastary, Bavaria October 14-16, 1988. The conference will be held in conjunction with the German Society for Complex Systems and Nonlinear Dynamics, The Society for Chaos Theory in Psychology & Life Sciences, and the Technical University of Munich.

Abstracts are due by 1 June, 1998. **For further information contact:** PD Dr. Guenter Schiepek, Research Center for Nonlinear Systems, Sandr 41, D -80335, Muenchen; tel: (089) 54212915; fax (089) 5236978; e-mail: uf341am@sunmail.lrz-muenchen.de.

ROME, ITALY. The Societa Italiana Caos & Complessita will hold its 3rd annual international conference in Rome, Italy: Complexity and Evolution in the Living World. **For further information contact** Franco Orcussi, MD, President, SICC, Via Monte delle Gioie 22, 1-00199 Roma; tel & fax: (++39) +6 863-243-01; email: SICC@earthling.it.

BEER-SHEVA, ISRAEL. The First International Conference on Discrete Chaotic Dynamics in Nature and Society will be held Oct. 19-22, 1998 at Ben-Gurion University of the Negrev, in conjunction with Bar-Ilan University. Conference topics: First Principles of Discrete Dynamics and Calculus of Iterations, Discrete Time and Space in Complex System Dynamics, Controlling Chaos and Chaos Synchronization, Discrete Modelling in Artificial Intelligence Systems, Neural Networks, and Cognitive Science, Art & Humanities, Computational Chemistery, Biology, Physics, Psychology, Social Science Applications. **Further information:** Prof. Michael Sonis, Dept. Geography, Bar-Ilan Univ, Ramat-Gun 52900 Israel. Tel: 972-3-5318222; fax 972-3-5344430; e-mail: sonism@mail.biu.ac.il.



Conference, Workshops & Lodging Registration

EIGHTH ANNUAL INTERNATIONAL CONFERENCE OF THE SOCIETY FOR CHAOS THEORY IN PSYCHOLOGY & LIFE SCIENCES

July 31- Aug 4, 1997 Boston University, Boston, MA

Papers and programs report applications of chaos theory, fractals, nonlinear dynamics and related principles applied to many of the psychological subdisciplines, neuroscience, biology, physiology and other areas of medical research, economics, sociology, anthropology, physics, political science, organizations and their management, other business applications, education, art, philosophy, and literature.

Programs will include single papers, symposia, roundtable or salon programs. Subject matter may be theoretical, empirical, or methodology oriented.

IMPORTANT DATES TO REMEMBER: Registration for all speakers is required by May 20. All others should consults the table of rates and the registration form for options. All lodging requests must be received by June 25.

BRIEF SCHEDULE

July 31 Registration, Intermediate Dynamics Workshop,Opening Ceremonies

Aug 1 Conference Day 1

Aug 2 Conference Day 2, Banquet

Aug 3 Business Meeting, Clinical and Organizational Workshops

Aug 4 Departure day

LOCATION, ACCOMMODATION, REGISTRATION

This year's conference will be held on the campus of Boston University, in the heart of Boston, just across the Charles river from Harvard and MIT. Accommodation will be available in suite-style residence on campus. Please see the registration form attached to the end of this file for rates and selections.

SPECIAL GUEST SPEAKER: **MICHAEL TURVEY**, University of Connecticut. *Other special guests TBA.*

WORKSHOPS (all full-day programs)

Confronting Complexity in the Wild: Principled Study of Real Nonlinear Systems.
Given by Robert J. Porter, Ph.D.

This full-day workshop is designed for those who are familiar with basic concepts but who wish to deepen their understanding in ways that facilitate its application. The objective is to aid workshop participants in formulating new ways to conceptualize and study nonlinear systems in their individual areas of interest. A tutorial review will be incorporated into demonstrations and discussions of a representative sampling of study designs and data analysis methods.

Topical Outline: The Complex System Menagerie: A field guide for identification. Strange Tracks: Temporal dynamics and time series analysis. Stalking Structure: Fractal dynamics and measures of dimension Capture and Study: Catastrophes, cusps, and similar creatures. Virtual Taxidermy: Models, automata, and surrogate data. Breeding, Training, and Release: Controlling chaos in Jurassic Park.

Robert J. Porter, Ph.D. is Professor Emeritus of Psychology, University of New Orleans; Clinical Professor Emeritus, Otorhinolaryngology and Biocommunication, LSU Medical School; and President, Lambda Consulting. Bob is currently President Elect of the Society, has over 25 years of experience teaching and consulting in laboratory and field research. He specializes in difficult problems in research design and data interpretation in the behavioral and social sciences.

Riding the Waves of Emergence: Self-organization in the Workplace
Given by Jeffrey Goldstein, Ph.D.

This workshop will present theory, strategies, and tools for how to apply the phenomenon of emergence in self-organizing, complex systems to businesses and institutions. We will look at the development of the idea of emergence from the first half of the twentieth century, its

scientific and philosophical critics, lessons to be gleaned from these critiques, and the re-birth of emergentism in recent research into complex systems. The emphasis will be both philosophical and theoretical as well as practical. The theory side will look at emergence as an explanatory construct in studying organizations; and the practical side will deal with how emergence and self-organization can utilized by leaders, consultants, and other organizational practitioners.

Topics will include: Emergent Evolutionism; Problems with Early ideas of Emergence; Characteristics of Emergent Phenomena; Identifying Emergence; Emergence: Processa and Outcome;Opening-up the Black Box in Neo-emergentism; Snares that Accompany the Construct of Emergence; Predictability and Unpredictability of Emergence; Creativity Research and Emergent Phenomena; Innovation, Radical Novelty, and Emergence; Channeling Emergent Phenomena in Constructive Directions; Emergence, Coherence, Conformity, and Conflict; Guidelines for Leaders.

Jeffrey Goldstein, Ph.D. is currently Associate Professor in School of Management and Business, Adelphi University; Past President of the Society for Chaos Theory in Psychology and the Life Sciences; and author of *The Unshackled Organization: Facing the Challenge of Unpredictability Through Spontaneous Reorganization*; and consultant to many public and private organizations.

Clinical Dynamics Workshop
Given by Michael Bütz, *Ph.D.*

This full-day workshop will translate theoretical aspects of nonlinear dynamical systems theory into guidelines that can be used in assessing and treating psychotherapy clients. It draws on the expertise of numerous clinical contributions and shows how tha background can be applied to utilize chaos theory. Also, linking chaos theory with existing psychological theories and establishing areas of clinical pursuit emphasizes the relevance of the new science in providing more flexible and useful models for understanding human behavior. Individual, family, and group situations will be considered.

Michael R. Bütz, Ph.D. is clinical psychologist in private practice in Wyoming, USA. He is the author of, "Chaos and Complexity: Implications for Psychological Theory and Practice;" co-editor of "Clinical Chaos: A Therapist;s Guide to Nonlinear Dynamics and Therapeutic Change" (with Linda Chamberlain) plus numerous other works.

PUBLICATION VENUE:

The principal papers of this conference will be published in Nonlinear Dynamics, Psychology & Life Sciences conditional on arrangements with authors. See section on Membership below.

REGISTRATION

The registration fee for this conference will be US$130 for regular members, US$110 for students, and $185 for non-members until July 15. Afterwards, the door-registration rates of $135/155/200 apply.

The Banquet dinner on Saturday, August 1, and AM and PM refreshments are included with your registration.

Special: This year you can bring a non-member spouse to the conference at a special discount rate. To avoid confusion, the non-member spouse must register at the same time as the member.

Workshops: You can register for workshops on the same form as regular registration.

MEMBERSHIP

Take this opportunity to start or renew your membership, you can take advantage of the special prices for conference registration. Other benefits of membership include a subscription to Nonlinear Dynamics, Psychology, and Life Sciences, which is the quarterly research journal of the Society, and the SCTPLS Newsletter (published roughly quarterly).

The term of membership for the regular option, which is available to all existing and new members, runs from 1 Sept., 1997 through 31 August, 1998. It includes back-issues of the Newsletter and a full year of NDPLS 1988, which is issued in January, April, July, and October.

The Special New Member Kit is designed to keep our newest members up to date on the important completed works of nonlinear dynamics research in psychology and life sciences. Membership with this package starts now, and runs until 31 August, 1999. It includes full volumes of NDPLS Vol. 1 (1997), Vol. 2, (1988), and Vol. 3 (1999), and all the Newsletters between now and then.

LODGING

Please see the back side of the registration form for a detail of the loding options available

PARKING

Permits are available at $20 each. If desired please indicate on the registration form under "lodging."

Society for Chaos Theory in Psychology & Life Sciences
REGISTRATION FOR
1998 Annual International Conference and Workshops

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

Name _____

Address _____

City _____ State/Province/zip/postal code: _____

Country _____ e-mail: _____

Tel: _____ FAX: _____

For student members/registrants: What is your institution and program of study?

_____

Please check any and all your registration choices on the form below. Return with your payment to the registration desk. Make check payable in US dollars to: **Society for Chaos Theory in Psychology & Life Sciences (or SCTPLS). Keith Clayton, Ph.D., Secretary, Society for Chaos Theory in Psychology & Life Sciences, Dept. Psychology, 301 Wilson Hall, Vanderbilt University, Nashville, TN 37240 USA.**

1. Membership

_____ $60 1997-8 Regular includes Vol. 2 of NDPLS Membership thru 31-Aug-98

_____ $50 1997-8 Student includes Vol. 2 of NDPLS Membership thru 31-Aug-98

_____ $120 NEW MEMBERSHIP START-UP KIT: includes membership thru 31-Aug-99, Newsletters starting now, NDPLS vols.1-3. *Fractal planets* poster while supplies last.

2. Conference Registration

BEFORE 15 JULY, 1998:

_____ $130 Regular members

_____ $110 Student members

_____ $180 Non-members

AFTER 15 JULY, 1998

_____ $155 Regular members

_____ $135 Student members

_____ $200 Non-members

NON-MEMBER SPOUSE

_____ $ 50 (Anytime). Bring one along!

3. Lodging

_____ **Please total from other side of this form.**

_____ $20 Parking permit

4. Workshops (all full day)

NONLINEAR DYNAMICS IN THE WILD

_____ $150 Regular

_____ $ 75 Student

ORGANIZATIONAL

_____ $150 Regular

_____ $ 75 Student

CLINICAL

_____ $150 Regular

_____ $ 75 Student

5. TOTAL -- Please total your selections:

US$ _____

PAYMENT TYPE:

___ Personal check ___ Bank check

___ American Expr. ___ Discover

___ MasterCard ___ Visa

Card # _____

Expiration Date _____

Signature _____

SCTPLS CONFERENCE '98
LODGING FORM

Please use this form:

1. If you are selecting lodging accommodations registering for the conference at the same as as you are registering for the conference, please total your selections below and enter on Item #3 on the front of this form.

2. If you have already registered for the conference and you are selecting lodging accommodations only at this time, please be sure to complete the name & address information, enter the total of your selections below on Item #3 on the front of this form, and supply the payment type information request on the bottom of the right-hand column.

DATES REQUIRED
Check all dates you require. Nights of:

_____ July 30
_____ July 31
_____ August 1
_____ August 2
_____ August 3
_____ August 4

ACCOMMODATIONS REQUIRED
Please select only one option

_____ FULL SUITE @ $ 110 /night
_____ HALF SUITE @ $ 55 /night
_____ SINGLE DORMITORY @$ 45 /night

SUBTOTAL LODGING

$_____ Multiply number of nights by rate selected, and enter on front page, item 3.

SUITE MATE

I would like to share a suite with:

_____

who is
_____ registering with me on this form

_____ registering separately

DESCRIPTION OF ACCOMMODATIONS

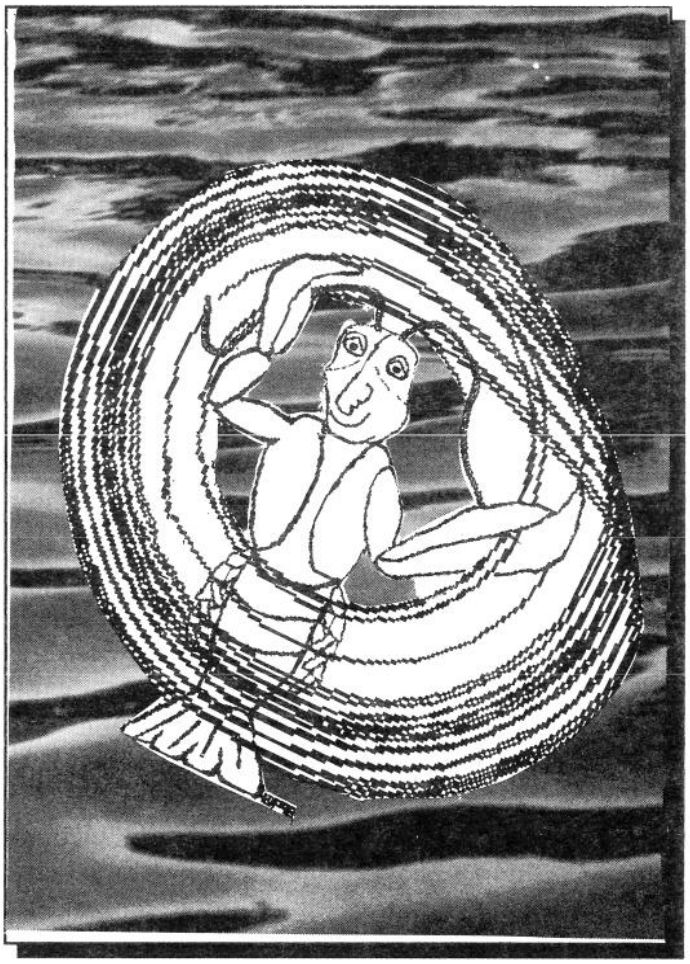
Boston University is offering suit-style accommodations for SCTPLS conferees. Each suite includes two separate bedrooms and common area, one bathroom that is shared between the residents of the two bedrooms. A HALF-SUITE indicated on this form is one bedroom. Suites are air-conditioned.

Couples requesting to share a suite are welcome to do so, and should indicate that they want a FULL SUITE.

If you have made arrangements with some else to share a suite, please indicate that person on the line on the space provided to the left. Also indicate whether that person is registering with you on this form or whether we should be looking for a separate form for that person If you do not select a suite mate, one will be arranged by the SCTPLS conference staff.

ALTERNATIVE ACCOMMODATIONS. Boston University is offering dormitory style single accommodations at a lesser price. Like conventional university dormitories, residents share a large common bath facility. These rooms are not air conditioned.

DEADLINE. All lodging requests must be received with payment by June 30, 1998. The Society will release unused hotel space back to the University at that time.



http://www.vanderbilt.edu/AnS/psychology/cogsci/chaos/cspls.html

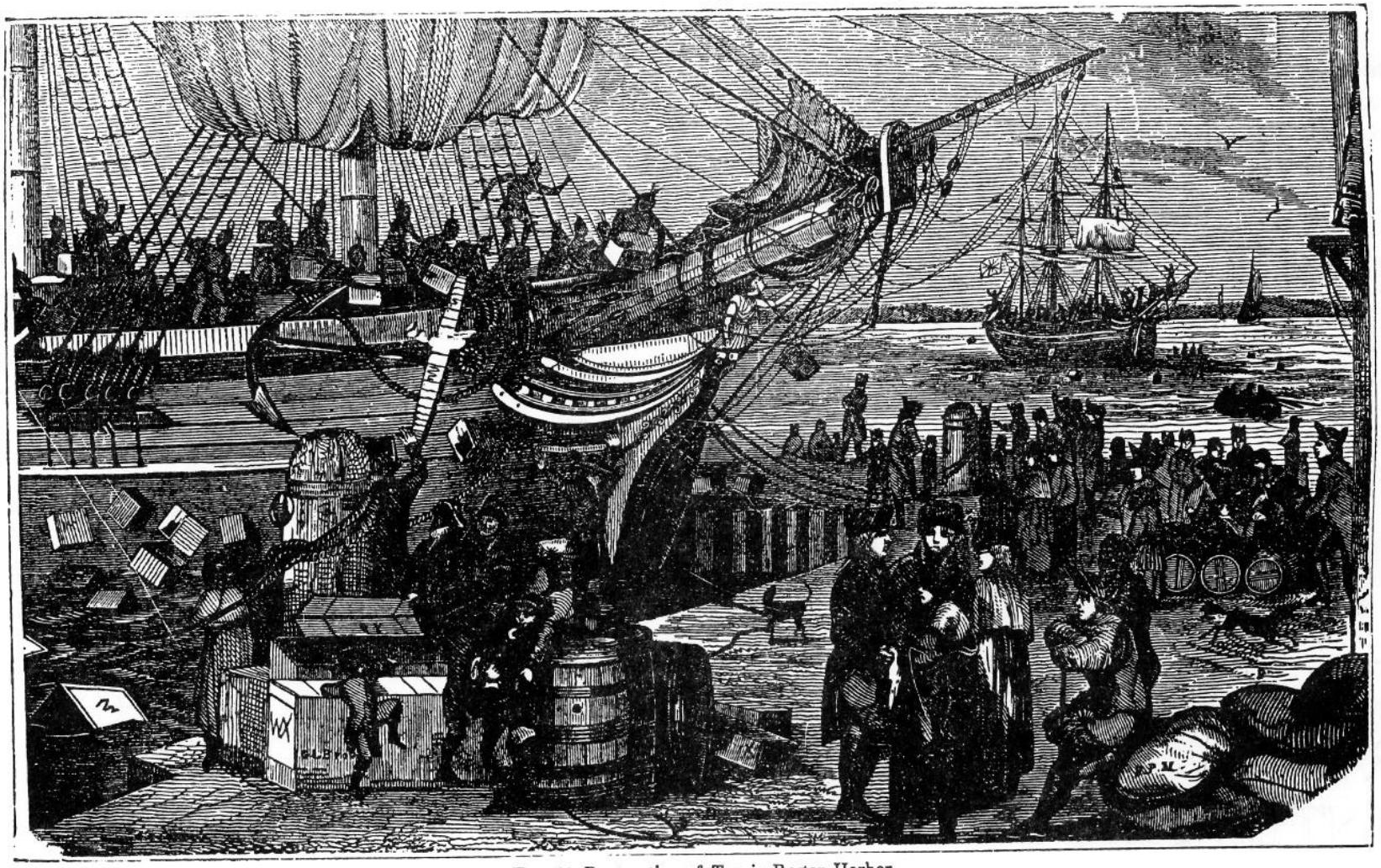
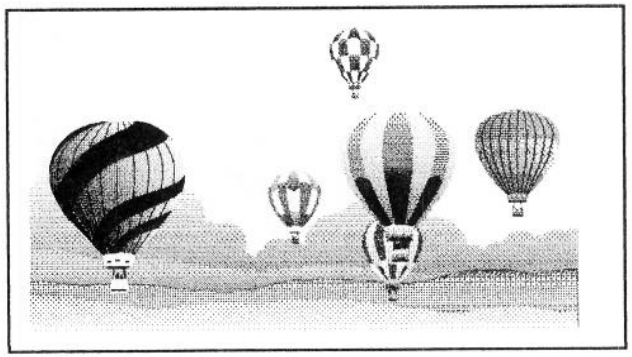


FIG. 54. Destruction of Tea in Boston Harbor.

If underliverable return to:

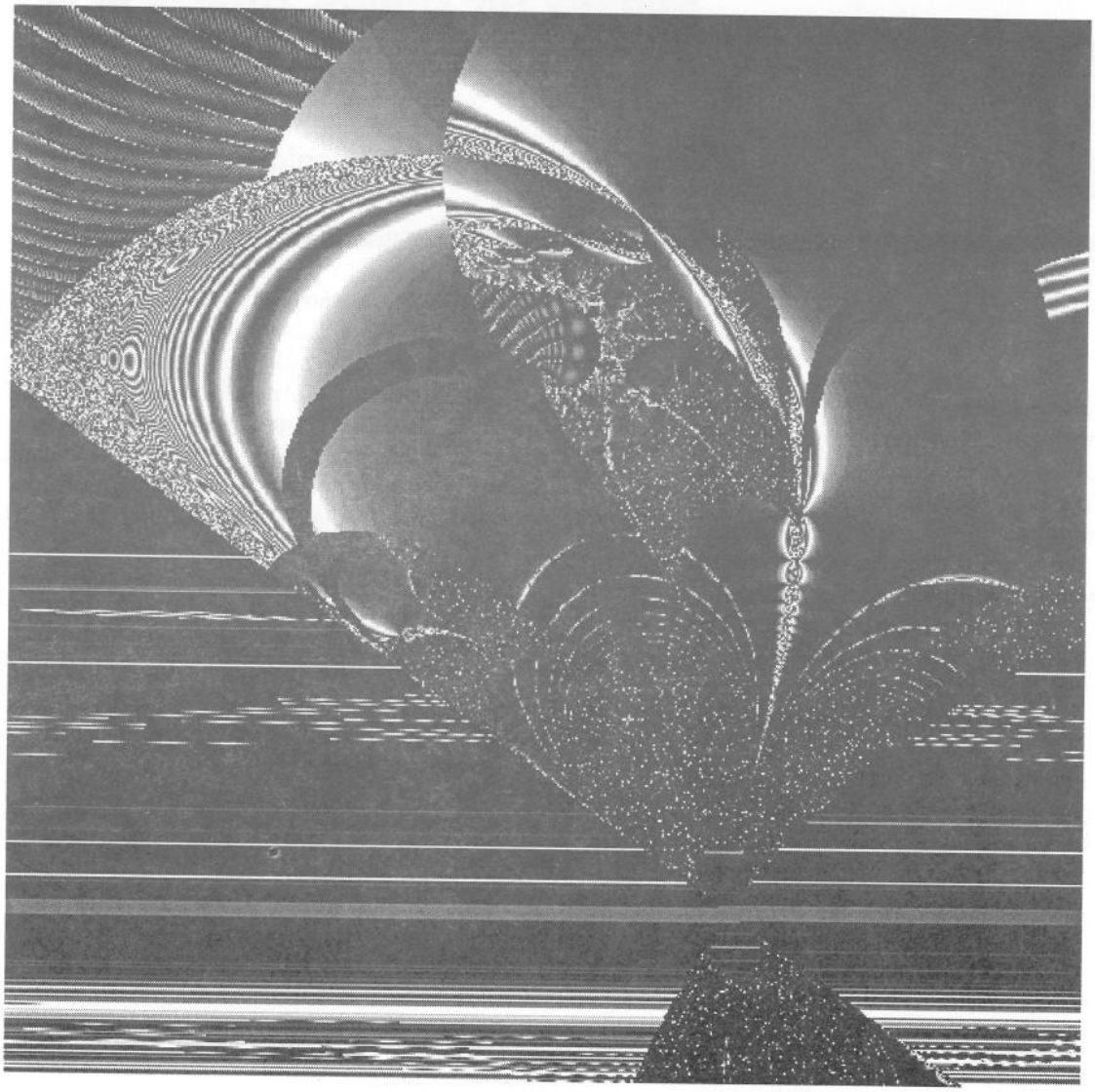
Society for Chaos Theory in Psychology & Life Sciences
Dept. Psychology, Marquette University
P. O. Box 1881, Milwaukee, WI 53201-1881 USA

FIRST CLASS MAIL
IN USA



OTHERWISE:

AIR MAIL
PRINTED MATTER



Society for Chaos Theory in Psychology & Life Sciences

8th Annual International Conference

Boston University 31 July - 3 Aug., 1998