Society for Chaos Theory
In Psychology and the Life Sciences

March - June 1994   NEWSLETTER   **Volume 2, Issue 2**

DEADLINES & DUES

Time moves apace. Lodging reservations for the annual conference should be made by **April 22,** Abstracts should have been sent in by **March 15**.

If there is a '93 on the corner of your newsletter's address label, your membership has expired. Please use the form on the back of the newsletter to forward dues and information changes to the Society offices in Alhambra. Thanks.

1994 CONFERENCE

The annual conference promises to be an exciting amalgam of diverse disciplines extending from the clinical to the mathematical, with all stops in between. Topics so far include:

- Co-existence of chaotic and periodic attractors in a model of enzymatic reactions
- Chaos and Self-similarity in the Creative Process
- Exploring the Idea of Culture Using Random Cellular Automata
- A Dynamical Systems Model Using a One Dimensional Map to Explain Why Dieting Doesn't Work
- Deep and Surface Structure In Cellular Automata to Model Robustness in Social Systems
- Chaotic Patterns in Data from Franchise Businesses
- A Case Study of Manic-depressive Illness Using a Chaos Model
- The Collapse of Complex Societies and Instability as a Precondition for Self-organization in Social Systems

The special Guest Speaker will be Dr. James Yorke from the University of Maryland. Dr. Yorke, of course, is famous for being one of the early explorers of chaos. He and Li coined the term "chaos" in an early article and he continues to be one of the pioneers in this expanding field. His talk will include, among other things, the changing meanings of the term "chaos." We are also working on other guest speakers and will keep you informed on this.

Facilities: The conference will be held at Johns Hopkins University, Baltimore, one of the truly classic and classy universities in the world today. The campus is beautiful, the housing is very cozy, and the staff is very accommodating. There are telephones in every room, exercise equipment on each floor, and assorted game rooms.

Moreover, the cost is unbeatable. Rooms are $29.70 per person per night for a double, $37.10 per person per night for a single. Food is $17.08 per person for three meals per day. Parking is $2.00 per day. Registration is $75 regular and $35 for students. We're also planning a special dinner.

Methods Workshop: On June 28-29, just following the annual meeting, the Society is sponsoring a tutorial workshop on research methods in nonlinear dynamic and complexity (see notice on page 3 and registration form at back). We highly recommend this workshop for those of you who are just beginning in the field of nonlinear dynamics or complexity.

Reservations: As the notice above indicates, reservations for lodging must be received (with

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check) by April 22. See the form on the back of the newsletter to register for the conference.

Baltimore: The Harbor Area of Baltimore underwent a complete overhaul several years ago so now there are many sights to see there including a great Aquarium, boat rides, a wide panoply of restaurants (featuring of course, the delicious Baltimore Hardshell Crab) and shops. Moreover, there are several museums accessible to the university.

Some of our members either attended Johns Hopkins or are currently on staff there, so I'm sure they will be able to show us around Baltimore.

PROGRESS REPORT

Publication of a Journal: Jeff Goldstein has taken on the job of getting a journal off the ground. A number of parallel chaos/complexity/dynamics groups from Australia to Greece have expressed interest in joining the effort – this will help provide the circulation levels needed for a journal to survive. Jeff and Sally Goerner will be meeting with one of the interested publishers at the end of March.

Publication of Proceedings: Robin Robertson has spent innumerable hours organizing and editing the current volume of collected papers of the Society. Several publishers are now interested, including Lawrence Erlbaum and World Scientific. Many thanks to Robin and to Allan Combs for his publishing expertise.

An Italian Branch of the Society Opens: Under the initiative of Dr. Elena Liotta, The American University in Rome is forming an Italian chapter of the Society for Chaos Theory. They will be sponsoring a 'Congress on Chaos' at the Rome Goethe Institute at the end of October. Participants will include Peitgen, Ruelle, and Lorenz. Congratulations, good luck and thanks.

For information about the Congress on Chaos in Rome, contact: Dr. Elena Liotta, Loc.Torre S. Servero 51, 05018 Orvieto (TR) Italy; fax (0)763-28590; phone, 0763-28590.

CALL FOR NOMINATIONS

Presidents of the *Society for Chaos Theory in Psychology and the Life Sciences* serve for one year as President-elect followed by a one-year term as President. We are now calling for nominations of candidates to serve as President-elect (1994-95) and President (1995-96). Candidates should be members of the *Society* in good standing and have the willingness and ability to lead a new professional organization through difficult academic and economic times.

Nominations should be submitted by June 10 to:
Nominations Committee
c/o Dr. Carlos A. Torre
2765 Yale Station
New Haven, CT 06520
Phone/Fax: 203-489-7070

Nominations will be announced at the last business meeting of the annual conference at Johns Hopkins University. The July newsletter will include a mail-in ballot and a statement of qualifications and plans from each candidate. The election results will be announced in the September newsletter.

REPORT OF THE 1994 WINTER CHAOS CONFERENCE
By
Karen VanderVen, Ph.D.

The Winter Chaos Society meeting Feb. 4-6 in New Haven, organized by Carlos Torre and Angela Vicenzi, attracted over 25 people from the Eastern Seaboard (including your scribe who came all the way from Pittsburgh.) A wide array of disciplines and fields were represented including economics, business, psychology, human development, nursing, physics, computer science, psychotherapy, and art. Awaiting all was a pleasant, comfortable Conference center, and a structured but flexible program of varied activities. A 'chaos' perspective pervaded all elements of the meeting from the good dinners whose carrot curls bore an uncanny resemblance to a Lorenz-attractor to a bifurcative side trip into New Haven that allowed participants to visit Yale, museums, and shop.

This synopsis both summarizes the various presentations and presents an overview of the conference, its flavor and the major themes that seemed to emerge from the presentations viewed collectively.

'Unpredictability' is the watchword for a good chaos conference and Friday night the group was treated to a surprise appearance from Nobel Laureate, "Dr. Orpheus" (aka **Ted Melnechuk**) who had privy to a set of marvelous nonlinear limericks written by Henri Poincare. Dr. Orpheus (Ted) read them to an appreciative audience. Two samples, showing the sharp relationship between chaos and the limerick poetic form, follow:

"Since the limerick form's an attractor,
Your replicas should be exact, or
If not well rhymed and dactyl
They'll start to go fractal
And then you'll need a redactor".

and

"If a system's attractor is strange
You will see its trajectory range
Through every spot
You can possibly plot
In the state space of temporal change"

Readers who would like the complete set of these limericks, may contact Ted Melnechuk, their 'literary executor', at 251 Pelham Rd., Amherst, MA 01002.

With everyone's attention thus engaged, the time was opportune for the Society's former President **Fred Abraham** to present a basic review of 'chaos' (or dynamical systems theory as he conceptualizes it), showing how it provides a common language for

Workshop on Methods

The Society will provide a two-day workshop on nonlinear methods **June 28-29** at Johns Hopkins University (following the annual meeting). This workshop is intended as tutorial, so novices are welcome. The emphasis will be on down-to-earth discussions and demonstrations of the methods and concepts listed below.

The workshop will have segments for nonlinear dynamics and complexity as described below. (The segments are independent so you can take either one or both, as you wish.)

Nonlinear Dynamics Segment ⇒ **Chaos, Attractors and Fractal Dimension Analysis**
Dr. Allan Combs and Dr. Tom Gentry — Two three-hour morning sessions (9 AM — 12 PM).

This is intended as an introduction to nonlinear dynamics, made as accessible as possible. It will include demonstrations of software using real data from mood cycles to reactions times. The tentative outline is:

- Basic concepts (for example, phase space, fractals, Lyapunov exponents)
- Attractor Construction and Reconstruction Techniques
- Distinguishing Chaos from Noise
- Calculation and Applications of Fractal Dimension Analysis

Complexity Segment ⇒ **Complex Systems Theory and Methods**
Dr. William Sulis — Two three-hour afternoon sessions (1:30 PM — 4:30 PM).

Dr. Sulis describes this as a *gentle* introduction to complex systems: entropy, phase transitions, scaling, self-organization, emergence and edge of chaos using extensive illustration with cellular automata, artificial life and psychopharmacology. The tentative outline is:

- Introduction to Complex Systems including complexity, edge of chaos, adaptation, evolution, and emergence.
- Complex Systems Methods including cellular automata, Boolean automata, artificial life, and genetic algorithms
- Introduction to Ergodic Theory and Statistical Mechanics and their applications to human science research
- including critical exponents, scaling, spectra, order parameters, phase transitions, entropy, ergodicity.

Cost is $100 per segment. Lodging and meals are available through Johns Hopkins at the same rates listed on page 1 for the annual conference. If you are coming to the annual conference you may just stay over using the same accommodations simply paying for an additional two days.

To register: Send form on at the back of the newsletter and check (payable to The Society for Chaos Theory in Psychology and the Life Sciences) to:

Dr. Sally Goerner, 374 Wesley Court, Chapel Hill, NC 27516, 919-932-5587, email: goerner@gibbs.oit.unc.edu

understanding scientific meta-modeling practice. The first concept he introduced was a 'dynamical system' for which the graphic representation is a vectorfield; the next was the 'dynamical scheme' - a dynamic system with control parameters. The final level was a 'complex dynamical system' which are dynamic schemes one or more of whose control parameters are a function of the states of one or more dynamical systems. Fred presented the sequence of concepts with accompanying graphics, illustrations and definitions from his book *A Visual Introduction to Dynamical Systems Theory for Psychology*. The presentation also considered such core issues as the "language" problem in social science and metamodeling; the role of noise in modeling; probability and deterministic chaos; and attractors: fixed point, cyclical, periodic and chaotic.

"So You Found Chaos in Your Data - So what? Scientific Explanation in Applied Chaos Theory" was the title of **Jeffrey Goldstein's** evocative discussion of what it means when we actually detect chaos in phenomena we're observing and trying to understand. Taking issue with philosopher of science Stephen Kellert, Jeff believes that we need to trace observations of chaos in our data back to their causal roots and try to attach the data to them. Explanation should include the causal. He discussed the types of explanation that have been used in applied chaos theory as: 1) disproving explanation, e.g., using evidence of chaos to disprove earlier hypotheses that a system was orderly or not; 2) directional explanation, e.g., using chaos as an indicator of the underlying dynamics of the system; and 3) discovery of patterns, e.g., using the discovery of chaos to confirm that there is pattern in data; 4) quasi-tautological (begging the question).

William Sulis presented "A Framework for Understanding the Relationship between Different Levels of Description and the Variables Being Utilized." In it he clarified the characteristics of a complex system. These include: a large number of agents, multiple time scales coexisting, a hierarchical organization with multiple relationships between levels in hierarchy; non-homogeneous; is in non-equilibrium; operates in a non-stationary environment; is computations (that is, is oriented towards a goal), is finite, non-local (systemic connections may exist at some distance form the subject system), and 'noisy'. He continued an intriguing discussion of the complex relationships that may exist between surface behavior; and the deeper internal referent - rule space - which may be

quite similar - or different. For example, one can have 'garbage' surface behavior and fixed rules 'below' or the reverse; it being hard to determine whether the underlying rules are deterministic or stochastic. Noise, however, can shift a system from one state to another. Time, of course, is a crucial variable in understanding the relationships in levels of systems, since systems, as they inevitably evolve over time, break down over time, and then buildup into larger systems.

Art Enright and **Don Booker's** presentation led off two discussions on the applications of chaos to economic issues. They showed how many errors in present economic forecasting methods can be reduced by introducing a non-linear component. According to Art, observational data series have shown the presence of a deterministic nonlinear dynamic (DNLD) or 'chaotic' behavior. Adding DNLD to economic forecasting has made it possible to predict successfully the direction and momentum of some interest rate changes six months in advance. Furthermore, in his own study Art found that interest rates of a number of US treasury issues did not vary randomly as had previously been thought but rather indicated low dimensional convergence when converted to multi-dimensional series. Similarly, random data was found to be constrained as would be by the presence of a strange attractor. In other words, a DNLD was present in the Treasury series. The point was made that the methodologies used in his study could be used in forecasting or quantitative behavior predicting in other disciplines as well.

In another economic perspective, **Tom Dandridge** showed applicability of chaos to entrepreneurial activities with particular reference to franchising, which he defined as 'synergistic control over a group'. In evaluating performance of franchises, complexity is reflected in changes in sales performance over a time trajectory.

Moving more specifically into the realm of human behavior and health and social service interventions were **Angela Vicenzi** and **Karen VanderVen**. Presenting on "Chaos as a Paradigm for Nursing in the Community" Angela indicated that nursing theory traditionally has focused on the individual, rather than the community and familial contexts in which their health status and well being evolves. Chaos, embracing complex nonlinear systems, provides an ideal framework for transposing concepts from public health to yield a unique nursing paradigm that integrates concerns both of the individual and the community. The contemporary

view of nursing that results from this paradigm embraces a holistic view of people that respects individuality and uniqueness. Most interesting, in the new paradigm, illness is rigid and stable, whereas health is a pattern, dynamic, nonlinear and able to use feedback processes to regulate status within bounded parameters.

In a similar vein, Karen VanderVen showed how viewing traditional social service interventions through a "chaos lens" could explain why so many of them are only 'successful in the short run or not successful at all. An emphasis on control, along with lack of tolerance for ambiguity and 'disorder', yields reductionistic, linear interventions such as behavior modification, narrowly focused educative efforts, and additive practices, e.g., trying to increase learning by simply lengthening the school year without transforming what goes on in schools. Recursive aspects, following Bateson's model, often serve to regenerate the very problems that are to be eliminated. To enable more effective interventions to occur requires that their designers be able to understand chaotic aspects of social systems and services. This in turn requires a high level of mature cognition, and particularly a new epistemology for professional educators, to which concepts of 'ill structured' knowledge and fuzzy logic would be relevant. Preparing people to be able to 'think' about the work in a chaos paradigm can begin in early childhood, with well-facilitated play and exposure to increasingly complex play materials as the best way to encourage divergent thinking and creativity.

Derek Paar's presentation, "Confusion, Playing and No-ing" came after dinner. Contending that the reality of the world is imprecise and confusing - meaning being always in motion, changing, ultimately unknowable - Derek stressed that this, rather than recognizable and concrete order should serve as our starting point for science, knowledge, and meaning. Paradoxically, in a connected and moving universe to 'know' any aspect of it (object, feeling, thought, and the like) means temporally negating all the rest – an act of 'no-ing'. The creative negational act of 'no-ing' is how we come to 'know' anything in a confusing universe; it is present everywhere from genetic coding to politics. There are several ways to create (that is, to become confused and non 'no-ing'). One is to recognize that decay of one system may lead to the launching of a new one; another is to play, as an antidote against over 'no-ing' (trying to exclude difference as a way of

saying "What can I make of this?"). Play, in Yates words, is "noisy order...the character of life."

Joel Henkel's presentation, "Building on Bateson's Cybernetic Circuit Model of Mind" presented a perspective on Bateson, whose work had already been referred to as an aide to understanding chaotic phenomena. His exposition focused on Bateson's concepts of mental functioning as expressed in his immanent/ecological model, and his concept of the mind analyzed as a cybernetic circuit (using the thermostat as an analogy). Joel pointed out that as Bateson did not formalize these notions mathematically and felt this needed to be done in order for these seminal ideas to be further advanced. He used Donald McKay and Gerald Edelman as examples of individuals who have advanced on Bateson's work in more empirical mediums. In his book *Information, Mechanism and Meaning* (MIT Press, 1969), MacKay presents ideas on structure that can serve as an analogy to evaluate various models of mind produced in fields such as cognitive science. Gerald Edelman, whose experiential model of mind as described in *Bright Air, Brilliant Fire* (Basic Books, 1992) is particularly compatible with Bateson's ideas.

On Sunday, **Ted Melnechuk** offered additional insights and resource suggestions. He started by providing two references for Henkel's reference to "the shape of emotion." These were: *The Language of Music* by Deryck Cooke (Oxford University Press) and *Sentics: The Touch of the Emotions* by Manfred Clynes (Doubleday). He then reported results of his online search of the Medline index of recent medical journal literature (1968-1993). This search revealed 32 references on 'chaos theory', 41 on 'nonlinear dynamics', and 42 on 'attractors'. He suggests using all three when searching Medline and avoiding 'bifurcation' - a common biological term. Finally, he spoke on two approaches, which he hopes may support the convergence of psycho-biological unity. One is chaos theory because both psychological and biological phenomena are fractal - have similarity across a wide range of scales. Another is study of messenger molecules that evoke harmonious psychological and physiological responses.

Free copies are available of Melnechuk' recent summary of a conference on "The Applications of Nonlinear Dynamics to Immune System Regulation in Health and Disease" from the Program in Psychoneuroimmunology, Dean's Office, UCLA School of Medicine, 10833 Le Conte Ave. Los Angeles, CA 90024-1722.

The group was delighted to receive the *printed* text of **Michel Baranger's** presentation from last year's conference in Vermont "Chaos and Calculus" a Fairy Tale. This year, Michel provided a sequel presentation "Chaos, Complexity and Life" which examined the distinctions among these three. He suggests life has two major crucial characteristics: self-reproduction and robustness of the individual in relations to the environment; a robust individual can adapt if the environment changes. Michel described his version of the distinction between chaos and complexity. A phenomenon is chaotic if it displays 'sensitive dependence on initial conditions' and can be represented fractally; in other words, it has simple, identifiable elements, and nonlinear interdependence. Complexity, a more embracing concept, is not always chaotic; 'complex' phenomena lie somewhere between periodicity and chaotic; they may not necessarily have complex roots. A complex system interacts with the environment showing many kinds of behaviors that can't be predicted; some may be computational (goal-oriented) or patterned; or evolutionary. Referring to Chris Langston's work, he suggested 'artificial life' enters the schema in that we are really interested in is not how life as we see it 'is', but how it could be. If there are logical principles of life, perhaps can they be explored on the computer - 'in silico.'

The conference concluded with an open discussion covering everything from the congruence between chaos and mysticism and chaotic aspects of therapy, to chaos' pertinence to understanding such phenomena as manic-depression and hyperactivity in children.

Major Themes: The following major themes emerged from the Winter Conference as a whole:

1. Debating language: This is an on-going debate and there are very definitely different views. Issues include whether 'complexity' is subsumed within 'chaos' as the broader term, or vice versa. They also include levels of understanding. Can metaphoric or linguistic applications of chaos be done with reasonable accuracy without mathematical representation of the applications or the concept? Some believe 'importing concepts' such as chaos into other fields increases understanding of different phenomena, others do not. There is even questions concerning how to best 'represent' chaos (geometrically and/or mathematically).

2. The reality of the world is best represented by 'chaos', that is, nonlinearity, interdependence, and unpredictability. When we try to view the world as essentially orderly or linear, difficulties arise. When we accept it as essentially chaotic, the possibilities for new insights and actions are limitless!

3. The integrative function of chaos; There is a wide range of applications across human endeavors, from economic forecasting, entrepreneurship, health care, social services, psychotherapy, personality development, neurobiology, and cognitive science to the replication of life - to name but a few. Perhaps chaotic considerations can bring unity to biological and psycho-social functions.

4. The evolutionary aspect of chaos; the crucial role of time in understanding chaos; chaos itself as a part of evolution; the evolution of the concepts of chaos and complexity. The concepts of chaos and complexity are evolving into wider meanings and implications. Have they replaced linearity as a frame for an optimal world view? Only time, of course, will tell.

This summary now ends as it started, with a limerick (and deep apologies to Poincare/Melnechuk):

Recently there traveled to New Haven
Over Twenty of chaos' mavens
They talked fractals and recursion
At this delightful excursion
An experience that left them all ravin'.

Note: The author has attempted to replicate a presenter's meaning as closely as possible in this report within limits of space allotment, available information and her own understanding - and sincerely apologizes if any errors of fact or intent have crept in.

Knowledge Extraction Technology: Finding Solutions in Huge Nonhomogeneous Databases

By

John A. Allen, Ph. D.

Although the actual study of complex systems is rather new, it has long been felt that answers and solutions to many practical questions and problems might lie hidden within complex nonhomogeneous data sets drawn from such systems. Until recently,

however, methods that were capable of unlocking the mysteries of such databases were unavailable. About all one could do was to rely on woefully inadequate parametric, nonparametric, or multivariate statistics, or newer neural net or genetic algorithm analysis techniques that either relied on simplistic assumptions about the nature of the relationships within the data itself, imposed scaling restrictions of various kinds, and/or simply broke down in the face of large numbers of variables, missing values, or noise.

A new technology is now available, Knowledge Extraction Technology (KET), that does not suffer from these shortcomings. KET was developed over a twenty-year period by Dr. Nikolai Lyashenko in the old Soviet Union and then refined in the United States and Canada. It is aimed at discovering complex nonlinear multivariate relationships in data when insufficient knowledge is available for constructing a mathematical model.

KET is based on five analytic and two structural developments. The analytic innovations include: 1) the use of random set descriptions for the analysis of a statistical sample; 2) the use of the numerical characteristics of random sets as association measure between variables in a data set; 3) methods of nonlinear space decomposition that generalize the classical orthogonality concept; the use of hypermatrix definitions of analytic models to build fitting algorithms; the use of variations in metric functions for fast fitting. Structural innovations include methods for classifying and rating potential models and a processing method that allows the user to combine KET with contemporary nonlinear functional analysis.

These characteristics make it possible for KET to construct very fast algorithms for discovering nonlinear multivariate relationships in highly complex situations. It is an improvement over traditional linear and non-linear multi-dimensional regressions because it is model-free and scale-invariant (i.e., qualitative and quantitative data can be mixed within the data set in any way). It differs from non-parametric statistical procedures such as the currently popular neural network methodologies in that it is usually supported by some formal logic calculus determined by the data base under study.

KET is capable of providing a wide range of highly sophisticated data analysis services in fields of every sort from database management and marketing to risk assessment and process control. It is currently being used to evaluate pollution in a major watershed in the Eastern United States, to develop an entirely new means of "lie detection," to provide a decision management tool for use in evaluating company downsizing, nonlinear signal analysis, training and selection, and several other problem areas. It is especially useful in identifying nonlinear dynamics within "chaotic" systems.

KET has also been successfully applied to:
- Development of a system for sonic diagnosis of defects in concrete blocks (USSR).
- Synthesis and derivation of decision rules for MCG vs. ECG diagnosis (General Electric Corporation)
- Design of a metallurgic diagnostic system for a nuclear power station (Canada)
- Creation of an algorithm for automatically diagnosing bronchial asthma (World Health Organization)
- Design of a security system for a nuclear power facility (USSR)
- A system for detecting and correcting deviations in manufactured objects (GE, USA)

Dr. Lyashenko and Dr. John A. Allen will discuss KET at the Society's annual conference. In the meantime, you may contact them at: John A. Allen, Ph.D. Knowledge Extraction Systems 10412 Darby Street Fairfax, Virginia 22030 Phone: (703) 385-8965/ Fax: (703) 993-1359 or by E-mailing your request to jalle7@gmu.edu. Descriptive information and demonstration diskettes are available.

Calendar

Mar. 18-20	*Symposium on Nonlinear Econometrics* in Boson. **Abstracts due** Jan. 15. Contact by the Eastern Economics Association 401-232-6470, fax 401-232-6720.
Apr 24-28	*First World Congress on Computational Medicine, Public Health, and Biotechnology*, Austin TX. Proposals due in Oct. Information at 512-471-2472; email compmed94@chpc.utexas.edu.
May 11-12	*Symposium on Nonlinear Systems in Medicine and Biology*, Indiana University and Purdue University, Contact: Elizabeth Cox, SNS '94, Room SL2150, 723 West Michigan St., Indianapolis, IN 46202; Phone 317-274-9726; fax 317-274-4493.
June 4-6	*3rd European Conference on Artificial Life*, Held in Granada, Spain. Contact: Juan J. Merelo, Dept. Electronica, Facultad de Ciencias, Campus Fuentenueva, 18071 Granada, Spain; Phone 34-58-243162; fax, 34-58-243230; email ecal95@casip.ugr.es
June 1-2	*Chaos and Society International Conference*, Sponsored by the University of Quebec at Hull. Registration is due by April 30. Contact Prof. Pierre Lemieux P.O.Box 1250, Station B, Hull, Quebec, J8X 3X7, Canada; pierre-Lemieux@uqah.uquebec.ca, Phone: 819-595-3924.
June 8-10	Session on *Supercomputer Applications and Economics* at the IFAC Workshop on Computing in Economics in Amsterdam, The Netherlands. Contact Paul Beaumont, Dept. Econ., Florida State University, Tallahassee, FL 32306; beaumont@scri.fsu.edu; fax 904-644-0098.
June 24-27	*Annual Meeting of the Society for Chaos Theory in Psychology and the Life Sciences*, See notice on page 1.
June 28-29	Workshop on Research Methods in Chaos and Complexity, see notice earlier in newsletter.
July 7-8	*Experimental Psychology Society* meeting in Exeter, England is looking for submissions on the topic of Chaos Theory in psychology. Contact: J.R.Eiser, Eiser@exeter.ac.uk; fax 44-392-264623.
July 25-Aug.5	*Nonlinear Dynamics: 2nd Panhellenic Conference and 7th Summer School in Greece*, Contact: Moses A. Boudourides, Section of Physics and Applied Mathematics, Democritus University of Thrace, 67100, Xanthi, Greece; mboudour@vergina.eng.auth.gr; Phone: 30-541-20379, fax 30-541-20275.
Aug. 9	*Workshop on Applied Genetic and Other Evolutionary Algorithms*, in Amsterdam. Submit abstracts for papers by April 25. Contact: A.E. Eiben, Artificial Intelligence Group, Dept. of Math. and Comp. Sci., Free University Amsterdam, De Boelelaan, 1081a, The Netherlands; ecai-ga@cs.vu.nl.
Sept. 26-28th	*Australian National Conference on Complex Systems*, theme "Mechanisms of Adaptation in Natural, Man-made, and Mathematical Systems. Contact: complex@ucq.edu.au; fax: 61-79-309729.
Oct. 14-17	*International Conference on Jungian/Archetypal Psychology and Organizational Development*, Contact: John Hollwitz, Dept. of Communications Studies, Creighton University, Omaha, NE 68178.
Oct. 1994	*The Congress on Chaos in Rome*, Contact: Dr. Elena Liotta, Loc. Torre S. Servero 51, 05018 Orvieto (TR) Italy; fax (0)763-28590; phone, 0763-28590.

Software

Physics Academic Software Box 8202, NC State University, Raleigh, NC 27695-8202; 1-800-955-tas1 or 919-515-7447 or fax 919-515-2482 offers the following packages: Dynamic Analyzer (IBM PC $75 US); Chaos Data Analyzer (IBM PC $100 US); Chaotic Dynamics Workbench (IBM PC $70 US)

Chaos Data Analyzer is also available from Media Magic, P.O. Box 598, Nicasio, CA 94946; 1-800-882-8284.

The journal *Computers in Physics* also contains ads for similar packages.

Interest Area Contacts

The following is an updated list of contact people in various interest areas. You can use these people to begin networking with others in your area.

If your area is not listed and you are willing to be a contact person, please send your name to Dr. Sally Goerner, 374 Wesley Court, Chapel Hill, NC 27516 (919-932-5547), email: goerner@gibbs.oit.unc.edu.

Anthropology and Sociology:
Patrick Baker
Department of Sociology and Anthropology
Mt. Allison University
Sackville, N.B. EOA 3CO, Canada
506-364-2202 (w) 506-536-1474 (H)
Email: pbaker@mta.ca

Art/Art History:
Tobi Zausner
137 East 38th St, 6J
New York, NY 10016
212-686-5272 (Fax 212-686-1396)

Clinical Theory/Practice:
Ray Hawkins
Austin Mental Health
1600 W. 38th St. Suite 404
Austin, TX 78731
512-459-4101 (w) 512-477-7877 (H)

Clinical Research:
Gary Burlingame
Comprehensive Clinic
Brigham Young University
Provo, Utah 84602
801-378-7759 or 4050 (W)
Email: burlinga@tlrb.byu.edu

Consciousness Studies
Dr. Allan Combs
Department of Psychology
#1 University Heights
University of North Carolina at Asheville
Asheville, NC 28804-3299
PHONE:704-251-6423

Email:combs@unca.edu

Economics:
Stephen Guastello
P.O. Box 92305
Milwaukee, WI 53233
414-288-7218 (H)
Email:
6155guastell@vms.csd.mu.edu

Family Systems
Bill McCown
Nathan Kline Institute, Building 37
140 Old Orangeburg Road
Orangeburg, NY 10962-2210
914-365-2000 (w) 215-885-4666 (H)
Email: mccown@nki.bitnet

History/Philosophy:
Lillien Greeley
4 University Rd.
Cambridge, MA 02138
617-576-2034 (H)

Human Development:
Frank Master
Widner University
frank.masterpasqua@cyper.widener.edu

Jungian Psychology
Robin Robertson
P.O. Box 7226
Alhambra, CA 91802
818-281-3601 (H)
Email: 0005699249@mcimail.com

Learning Theory and Research:
John Cooney
Educational Psychology
University of Northern Colorado
Greeley, CO 80639
303-351-1642 (W)
303-351-2312 (Fax)
Email:
jcooney@dijkstra.univnorthco.edu

Language and Literature:
Bob Kahn
Center for Graduate Studies in Higher Order Literacy
P.O.Box 090603
University of Missouri at Kansas City
Kansas City, MO 64109

816-471-7123 (H) 816-235-2477 (w)
Email: rkahn@vax1.umkc.edu

Memory and Perception:
Keith Clayton
315 Wilson Hall
Vanderbilt University
Nashville, TN 37240
Email:
claytokn@ctrvax.vanderbilt.edu

Neural Nets:
Bill Sulis
Department of Psychiatry and Psychology
McMaster University
Hamilton, Ontario
Canada
416-772-7212 (H)
Email: psych@mcmaster.ca

Nursing:
Angela E. Vicenzi
Department of Nursing
501 Crescent Street
Southern Connecticut State University
New Haven, CT 06515
203-397-4156 (Ans. Machine)

Organizational Psychology:
Jeff Goldstein
Adelphi University
29 Hayes Rd.
Amity Harbor, NY 11701
516-789-4145
Email:
goldstein@adlibv.adelphi.edu

Physiology/Neurophysiology:
Wally Pritchard
RJR Tobacco Company
BGTC 611 R&D
Winston-Salem, NC 27102
Phone/fax: 919-741-4682
Email: wally@rjrt.com

Psychiatry
Hector Sabelli
2400 North Lakeview Avenue #2802
Chicago, IL 60614
312-942-0118 (w) 312-348-5679 (H)