

# SCiP

## **Society for Computers in Psychology Twenty-Fifth Annual Conference Los Angeles, California Westin Bonaventure Hotel November 9, 1995**

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It is our pleasure to welcome you to the twenty-fifth annual SCiP conference. The focus of the conference this year is the Internet: How it can be used in psychological research and in making the teaching of psychology more effective and efficient. Contributors have provided us with an array of papers and tutorials covering a number of current and important topics relating to the use of the Internet, and in addition we are offering an array of papers dealing with multimedia issues in teaching, computers in psychological research, clinical practice, and teaching. All of us associated with SCiP hope that these presentations will be informative and useful to all those in attendance.

We would like to thank our plenary speaker, Steve Kirsch of InfoSeek Corporation, our Past-President Paula Goolkasian, our President William L. Palya, our President-Elect Michael Levy, our Secretary/Treasurer Sarah Ransdell, each of the program chairs, all of the presenters, those who helped review the submitted papers, and the entire steering committee (listed below). We would like to especially thank Richard Yi, an EXCEL Scholar at Lafayette College for his help with the program. Each person has contributed to the success of this conference and to SCiP.

Robert W. Allan, Lafayette College  
& Fred Bremner, Trinity University  
Program Chairs

### Steering Committee

Doris Aaronson  
Drake Bradley  
Darrell Butler  
Nancy Duncan  
Peter Hornby  
Richard Lehman  
Ellen Rosen  
Walter Schneider

### Proceedings Editor

Robert W. Proctor

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## **Special Events in the Catalina Ballroom (These events ran**

## **concurrently with regular SCiP paper sessions)**

### **The Presidential Tutorial**

#### **The Complete Guide to the Internet and Related Utilities**

William L. Palya, Robert W. Allan\*,  
Donald Walter & Richard Yi\*  
Jacksonville State University, \*Lafayette College

A series of tutorial presentations on how to use Internet tools, including browsers (Netscape & Mosaic), search engines, email, FTP, Gopher & Telnet. These tutorials are ideal for those with little Internet background and for those who wish to better use the Internet to further their research and teaching activities.

### **Plenary Speaker**

Steve Kirsch

President, InfoSeek Corporation

How to Instantly Find Almost Anything on the Internet and the World Wide Web

The Internet has a wealth of information, but it's not organized. Although many free Internet search tools are available, it is difficult to know which tool to use for each type of search. Attendees of this session will learn simple, but highly effective searching techniques for the Internet, such as:

How to locate almost any page on the WWW in seconds

How to accurately identify which Internet Usenet Newsgroups are most relevant to a search topic

How to find out what people on the Internet are saying about a company, product or person

How to find someone's e-mail address

How to find images

How to use the Internet to instantly find the answers to everyday questions such as, "What is the best temperature for brewing coffee?"

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## **Paper Sessions & Symposia**

(Listed by meeting room)

### **Experiments on the Internet**

Chaired by: Michael Levy  
University of Florida, Gainesville

### **Human Factors Considerations in World Wide Web Page Design**

Frank M. Marchak  
TASC, fmmarchak@tasc.com

Designing documents for the World Wide Web is different than designing for paper. This presentation will begin by reviewing the basic elements of web page design, including web page essentials, visual design, and typography. Next the basics of navigating in hyperspace, including how to exploit the power of links, will be presented. Finally, current style guides will be examined and references to relevant web sites will be provided. Color printouts of actual web pages will be used throughout to illustrate examples of good and poor design.

### **Editing a Book on the Internet with Twenty-Nine Collaborators in Eight Countries in Twelve Months: A Case Study in Survival Tactics**

C. Michael Levy  
University of Florida  
& Sarah Ransdell  
Florida Atlantic University

Orchestrating and editing a major book with a large number of international collaborators on a tight time schedule can be a daunting task. We describe our experiences in accomplishing this task, using a variety of Internet services including email, FTP, and WWW servers to foster communication among collaborators during the entire process from the inception of the proposal through peer review of first drafts and completion of the finished manuscripts. While some of these activities benefit mainly from rapid delivery that could be accomplished almost as effectively using express mail services, others may be directly influenced by the open visibility of the processes. Using the Internet in this way also presents special problems that are non-issues using traditional modes of communication; for example (1) shielding draft versions of chapters from public inspection on the WWW or (2) dealing with enormous differences in technical expertise among collaborators in the use of this technology.

### **Hypertext Markup Language and Client/server Technology: Using the World-Wide Web for Data Collection**

Jarrod E. Jasper, R. Darin Ellis, Thomas B. Jankowski, Aziz Abdul, & Michael Marsiske  
Wayne State University

Recent developments in high-speed computer networks have enabled the communication and exchange of multimedia presentations between computers. Hypertext Markup Language (HTML) and client/server technology allow for the distribution of interactive multimedia documents from a server to participants using various geographically dispersed client workstations. In this paper, we argue that these recent developments may also lead to important advances in reliable data collection.

### **Studying Verbal Interaction on the Internet: The Case of Rumor Transmission Research**

Prashant Bordia Temple University, manu@vm.temple.edu

Computer-mediated communication networks provide an exciting new venue for the study of psychological, social, and linguistic aspects of verbal interaction. In addition to ease of data acquisition, they allow for naturalistic, unobtrusive, and ethical observation. This paper illustrates how rumor transmission research was facilitated by the advent of these networks.

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## **Symposium**

### **Psychology and the World Wide Web**

Organizer: Christopher Wolfe  
Miami University, Oxford, Ohio

The World Wide Web (WWW) is likely to have a major impact on many aspects of psychology including scientific communication, peer-refereed scientific journals, the teaching of psychology, and developing advanced applications. Eight papers are presented on the WWW and compiling mental health and psychological resources, creating psychology tutorials and courseware, creating a peer-reviewed journal, Common Gateway Interfaces (CGIs), and the Virtual Reality Modeling Language.

### **Compilation and Use of a World-Wide Web Index of Cognitive and Psychological Science Resources**

Scott Mainwaring  
Stanford University

What started out as an exercise in learning to write World-Wide Web (WWW) documents has evolved into an index (<http://matia.stanford.edu/cogsci/>) of over 600 pointers to WWW sites pertaining to cognitive and psychological science. This paper describes the structure of this index, how it was assembled, and how it is maintained. Information about the amount and type of usage has been gathered from automated logging of accesses to the index, as well as from email solicited from users.

### **A Psychiatry Department Website: Creation, Development & Maintenance**

Milton Huang  
University of Michigan

The World Wide Web is the fastest expanding part of the Internet, rapidly becoming an important information resource for psychiatry. This article describes the techniques our team acquired and developed in order to create the Website of the University of Michigan Department of Psychiatry, maintain the quality of the Website, and finally expand the range and support that this effort receives from both the Department and other groups in the field of psychiatry.

### **Creating Psychology Tutorials on the World Wide Web**

John H. Krantz & Brandi Eagley  
Hanover College

The potential impact that the World Wide Web (WWW) will have on Psychology and Psychology education extends far beyond the internet serving as a resource for information acquisition. Particularly through the WWW, there is a capability to develop interactive teaching resources with integrated multimedia capability. These resources can take the form of tutorials or quizzes. The current presentation will discuss through actual online examples how these resources can be developed and used.

## **The Dragonfly's Web: Courseware for Children Created by College Students on the World Wide Web**

Christopher R. Wolfe & Christopher A. Myers  
Miami University

Describes a successful approach to teaching first-year undergraduates to produce WWW courseware. Students were responsible for coding, writing, graphics, research, and theory. We taught that courseware effectiveness is a function of the behaviors it elicits. It appears that the exercise facilitated experiential learning, the application of learning, courseware, and hypertext design theories, and promoted critical thinking. We argue psychology students should develop useful Web pages as a learning experience and service to the field.

## **Creating a Peer-Reviewed Journal on the WWW: Journal of Behavior Analysis and Therapy (jBAT)**

Joseph J. Plaud  
University of North Dakota

The traditional method of disseminating results of scientific investigations is primarily the printed journal, which has several notable drawbacks, such as lag time to publication, limiting the audience to subscribers, arbitrary constraints of form and length, and a lack of interactivity. An alternative method of publishing is the electronic forum. This presentation will detail a new and high quality electronic journal, the Journal of Behavior Analysis and Therapy (jBAT), which has an internationally recognized editorial board members. The journal will be a comprehensive treatment of advances in behavior analysis and therapy, as well as clinical psychology, integrating basic behavioral research, and cutting across the many disciplines of scientific psychology. This type of journal does not even appear in the printed area at present. The coupling of this new format for the integration of clinical psychology, behavior analysis and behavior therapy, as well as the use of the Internet for rapid dissemination of empirical data and reviews over the World Wide Web puts this project in a unique position in the history of our scientific discipline.

## **CGI's: Gateways to WWW Power**

Jim Keiley  
Miyazaki International College

This paper will discuss how the power of the Hypertextbased information presentation system known as the Worldwide Web (WWW) can be greatly enhanced by scripts written using the Common Gateway Interface (CGI) protocol. CGI gateway scripts allow programmers to add functionality to the WWW that the original Web software authors left out by permitting the execution of external programs from a WWW server. Example applications of potential interest to psychologists will be presented.

## **Navigating and Interacting Within a Distributed Virtual Environment Using VRML, the Virtual Reality Modeling Language**

David Nadeau  
Supercomputer Center University of California, San Diego

The Virtual Reality Modeling Language (VRML) is the beginning of a fundamental paradigm shift in

the way we interact with information. It allows authors to construct and publish virtual spaces and shapes. The deeper ramifications of VRML create significant challenges for the development of navigation and interaction metaphors for distributed virtual environments. This paper will introduce the essential features of VRML, and discuss the features of VRML that make this problematic and propose possible solutions.

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## **Surfing the Internet**

Chaired by: Sarah Ransdell  
Florida Atlantic University

### **The Use of Internet to Support Psychology Education**

Annie Trapp, Nick Hammond & Dan Bray  
University of York

The Computers in Teaching Initiative (CTI) Centre for Psychology has been promoting the use of computers in psychology education for the last five years. The advent of Internet and ubiquitous access to the World Wide Web has the potential to revolutionise the way the teaching and learning of psychology can be supported. This paper describes how we are using the Web to support psychology education through information dissemination, the provision of teaching resources and facilities for communication.

### **Using a Local Web Browser as a Multimedia Platform for Lecture and Presentation Support**

Michael E. Mills  
Loyola Marymount University

Many web browsers, including Netscape and Mosaic, can be configured for use in a "local mode" (without an active connection to the internet). In this mode local files, graphics, audio and video can be accessed directly from the hard disk of the instructor's computer. By using a laptop computer, an LCD panel, and an overhead projector, an instructor can develop an integrated web-based presentation that replaces lecture transparencies, slides, chalkboard and brief audio and video clips.

### **Navigating the Internet: A Comparison of Mosaic to Netscape**

Lewis C. Orrell & Sarah E. Ransdell  
Florida Atlantic University, RANSDELL@ACC.FAU.EDU

The World Wide Web (WWW) raises fundamental questions about human-computer interaction. This paper will address the userfriendliness of navigating the Web using two graphic browsers: Mosaic and Netscape. Observations while using the two highlight some key differences. These differences will be discussed in light of research in traditional humancomputer interaction. In particular, consideration will be given to factors that influence the flow of information from the user to the system and back.

### **The Gnosis of Knowledge Navigation on the Net**

Erik Nilsen

Lewis & Clark College, nilsen@lclark.edu

A set of activities to expose undergraduates to global networking resources is detailed. Small teams of students collaborated with faculty searching the World Wide Web with a suite of Internet software tools. Detailed student logs provide useful insights into the challenges of searching for internet resources. Innovative and useful information was located for all but one of the eight projects. This exercise enhances the utilization of technology in the curriculum and research at the college.

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## **Symposium**

### **The Department Home Page: An Avenue to Promote Your Department and Its Work**

Organizer: John Krantz  
Hanover College

The psychology department's homepage is the first point of contact most users will have with a department when traveling over the World-Wide Web. Well over 100 psychology departments worldwide have homepages and more are being placed on-line all the time. As such it seems time to begin discussions as to how a homepage can best serve the needs of the department. Presentations in this symposium will discuss a range of topics including construction of resources and class materials, and even conducting psychological research on the web.

### **Suggested Standards of HomePage Construction**

John H. Krantz  
Hanover College

With the increasing number of departments developing homepages, it seems important at this time to discuss what types of information will give the greatest benefit to the users of these homepages. Part of the difficulty of designing a department's homepage is in defining the userpopulation. Some of the potential user-populations are students, potential students, department faculty, and colleagues at other institutions. They have distinct but overlapping needs that will be discussed.

### **Basics of WWW HomePage Construction: Making Yours an International Department of Psychology**

Joseph J. Plaud  
University of North Dakota

Homepage construction can give even the smallest academic department world access, in terms of both the sharing of information and reception of data from other departments. The WWW allows for rapid dissemination of information and data pertinent to the science of psychology, as well as the exchange of information relevant to clinical psychology. This presentation will explore the current status of psychology departments on the WWW, and analyze resources relevant to psychology on the Internet.

### **Introductory Psychology on the World Wide Web**

Mary-Louise Kean, Michael D'Zmura & Stephen Franklin

University of California, Irvine

We are using the World Wide Web in an introductory psychology course at UC Irvine. With the Web we can provide course materials with three components. First, we can present multimedia lecture notes to our students, complete with color pictures, sounds, movies, an index and a text search engine. Second, we can use client-side computing to present interactive demonstrations, simulations and experiments. Third, we can let students assess their own progress in mastering course material and also track students' use of the course materials.

### **Proper Methodologies for Psychological and Sociological Experiments**

Administered via Internet  
Claire M. Hewson  
University of Edinburgh  
Dianna Laurent  
Southeastern Louisiana University  
& Carl M. Vogel  
University of Stuttgart

This paper outlines specific methodologies for conducting research via computer networks. We point out pitfalls, for instance, educational skews in the subject pool and suggest a range of potential solutions. We also discuss the advantages of internet experimentation over previous modes of telecommunication facilitated research. Practical recommendations about the design of materials from both a technology and subjects standpoint will be discussed.

### **The World Wide Web as a Medium for Psychoacoustical Experiments: Experience and Results**

Norma Welch  
McGill University  
& John Krantz  
Hanover College

The World Wide Web provides an inviting opportunity to reach large numbers of people, both as an audience and as subjects for psychoacoustical experiments. Such use of the web poses a unique set of challenges. We present the methodologies used to prepare a multimedia primer in Auditory Perception and its applications in music perception, and the design of acoustical experiments to be conducted over the Web. As well, we discuss the response and experimental results.

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### **Analysis of Semantic and Clinical Data**

Chaired by: Matthew S. McGlone  
Lafayette College

### **Latent Semantic Analysis for Text-Based Research**

Peter W. Foltz  
New Mexico State University, pfoltz@crl.nmsu.edu

Latent Semantic Analysis (LSA) is a statistical model of word usage that permits comparisons of semantic similarity between pieces of textual information. This paper summarizes three experiments that illustrate how LSA may be used in text-based research. Two experiments describe methods for analyzing a subject's essay for determining from what text a subject learned the information and for grading the quality of information cited in the essay. The third experiment describes using LSA to measure the coherence and comprehensibility of texts.

### **Producing High-Dimensional Semantic Spaces from Lexical Co-Occurrence**

Kevin Lund, kevin@cassandra.ucr.edu  
& Curt Burgess, curt@cassandra.ucr.edu  
University of California, Riverside

A procedure is presented which forms vector representations of word meanings via analysis of lexical co-occurrence. This procedure is applied to a corpus of 160 million words of text from Usenet. The resulting vectors are examined for semantic content through multidimensional scaling, with positive results. Inter-vector distances are computed for word pairs and compared to reaction times in a single-word lexical decision priming experiment. Substantial and reliable correlations are found between inter-vector distances and reaction times, indicating that the vector representations carry significant amounts of information relating to word meanings.

### **A Two-Score Composite Program for Combining Standard Scores**

Larry D. Evans  
University of Arkansas for Medical Sciences, and Arkansas Children's Hospital

It is often desirable for practitioners to combine standard scores from different tests, raters, or times into a single composite standard score. Most often the result is a more reliable and accurate standard score. This paper describes a computer program that uses two standard scores and their reliability and correlation with a third variable to yield a composite standard score, reliability and correlation.

### **Computer Generation of Bivariate Normal Agreement Rates**

Larry D. Evans  
University of Arkansas for Medical Sciences, and Arkansas Children's Hospital

Bivariate agreement rates for psychological tests yielding normally distributed scores were generated using a microcomputer. The program generated 100,000 bivariate scores for tests with score correlations ranging from .95 to .00, and examined agreement at cutoff values of +3.00 to .00 standard deviations. A table presents percentages of cases in which both tests agree that scores fall above or below shared cutoff values. Simulation integrity, disagreement rates, and trends in the data are discussed, and examples are provided illustrating table use.

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## **Symposium**

### **Towards a More Neurotropic Transfer Function**

Organizer: Fred J. Bremner

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9:25-11:05 am, San Bernardino

The term neural network is applied to two distinctly different collections of processors. On the one hand, it refers to a computer resident set of nodes organized by a mathematical function that learns to solve a problem. On the other hand, neural network refers to a set of living neurons of some organism that function together to produce some resultant behavior. In general, the computer resident neural networks are believed to have only a cursory resemblance to biological neural networks. One way to compare these two types of networks is to study their transfer functions; that is how any two neurons whether biological or computer resident communicate with each other. Therefore this symposium is a study of transfer functions using both the top down approach and the bottom up approach. The papers by Mpitsos and Gallistel present biological functioning neural networks and then ascertain the neuromorphic transfer function by fitting a particular family of equations to the biological data. The papers by Gotts and Collins present a particular transfer function and then try to make it as neuromorphic as possible.

### **Degeneracy of Information Flow in a Deterministic System**

George J. Mpitsos  
The Mark O. Hatfield Marine Science Center, gmpitsos@slugo.hmsc.orst.edu  
& John P. Edstrom  
Oregon State University, edstrom@slugo.hmsc.orst.edu

The goal-directed behavior of the sea slug *Pleurobranchaea*, and of the underlying neural activity, has been shown to be variable, possibly chaotic. A number of quantitative measures such as dimensional analyses, analyses of surrogates constructed from the original spike-train intervals, and of mutual information and attainable information in the symbolized intervals, suggest that some of the activity is high-dimensional, possibly degenerate or noisy. As a step toward understanding the source of this variation, we have conducted a series of simulations on simple neurons defined by Hodgkin-Huxley membrane. Low level deterministic perturbation of EPSC-evoked action potentials, and analysis of spike trains in 2-3 cell networks, indicates that degeneracy of information flow across simple synapses is a predicted consequence of their dynamics. This fundamental degeneracy may underlie some of the noise observed in our biological system, and may be of adaptive value, as proposed by our own and other laboratories.

### **Neuronal Transfer Functions in the Time Domain**

C. R. Gallistel  
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Modern conditioning protocols are examples of multivariate (many CSs) non-stationary (reinforcement contingencies change) time series. The conditioning process is computationally specialized for solving such problems. How can we conceptualize the neurobiological bases for this computational capacity? One way the CNS might tackle the problem--a way that uses the many different clocks known to be present in the CNS--is by temporal filtering, which is a well documented process for extracting temporal structure in sensory systems. The temporal filters we suggest are like receptive fields; their response is determined by the match between the time line for a stimulus and the filter function. The use of exponentially decaying sinusoidal filter functions (Laplacian bases functions) captures the temporal structure of each time line, allows the computation of the relations between time lines, and permits the

recognition of nonstationarities. Processing a time line with such a filter bank is equivalent to computing its Laplace transform.

### **The Biological Efficacy of Squash Functions**

William Collins & Frederick J. Bremner  
Trinity University

The most popularized neural network strategy is backpropagation. It was the advent of this strategy that began the general interest in neural networks among researchers. Backpropagation is really a third generation neural network. The first two generations of neural simulation were not very neuromorphic on the one hand and could not solve nonlinear problems on the other. While backpropagation can solve non linear problems, its transfer function is considered to be a poor example of neuron functioning. However, Gardener (1993) has made a strong case for a backpropagating phenomenon in networks of living neurons. Assuming that Gardener's evidence is indicative of the real neural event, do the other mathematical operations of the back-propagation transfer function mimic or distort the real neural event. The particular operand of the backpropagation strategy addressed in this paper is the bounding or squash function.

### **Adaptive Neuronal Thresholds for Backpropagating Neurons**

Stephen J. Gotts & Frederick J. Bremner  
Trinity University

As researchers try to move from cybernetics to neural reality, it is time to look at the match between the backpropagation strategy and the functional parameters of neurons. The backpropagation strategy has three parts: 1) a multiplication of the data by the randomly assigned synaptic weight, 2) the addition of a threshold value and 3) the updating of the synaptic weights after each iteration by a difference equation which compares the input to the output. Typically the threshold portion of the equation serves a mathematical rather than a biological function. This paper explores the efficacy of using a more neuromorphic threshold function during the typical backpropagation procedure.

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## **Symposium**

### **Supercomputer Applications in Psychology**

Discussants:

Lynne K. Edwards (chief organizer and chair)  
University of Minnesota Supercomputer Institute  
Cynthia H. Null (co-organizer and co-chair)  
NASA Ames Research Center  
Stephen W. Link (co-organizer and co-chair)  
McMaster University

High performance computing is accessible to all through the national and regional supercomputer centers. Neural network models, statistical computation, human factor research, scientific visualization, for example, have benefited from high performance computers. This symposium presents (1) what current and potential uses for supercomputers are available; (2) a preview of Supercomputer

Applications in Behavioral Sciences '96 to be held in Minneapolis; and (3) reflections of the development and unfulfilled promises of supercomputers over the past decade.

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## **Problem Solving & Decision Making**

Chaired by: Darrel Butler  
Ball State University

### **A Real-time Data Collection System for Problem Solving Protocols**

Sharon A. R. Kristovich  
University of Illinois at Chicago

A computer program was developed to collect solution protocols with written explanations with a level of detail difficult to obtain with traditional "pencil and paper" tasks. The program automatically presents the instructions, problems, solution entered, changes to the solution, reason prompts, solution feedback, and system help in a "Windows" environment. With this program, a comparison of solution times across treatment groups is possible. Finally, protocols are stored in individual files, eliminating transcription, and a summary dataset for all protocols are created. The program was tested in a study where individual protocols were collected in small groups. This program can readily be adapted to different experimental contexts, and can be a useful educational tool.

### **Using electronic communications to develop expertise in team problem solving**

Louis Kruger, Northeastern University  
Steven Cohen, Tufts University  
David Marca, Marca and Associates  
Charles Lawrence & Alvan Hyman, Polaroid Corporation

We investigated a training program for developing expertise in team problem solving. Both Internet communication and face-to-face meetings were used to facilitate expertise. A central element of the program was the "linchpin expert", a trainer who served as a communication bridge on the Internet between a team of trainers and a team of trainees. Results suggested that electronic communication was related to the trainees' motivation to develop expertise.

### **Assessing Decision Strategies Using HyperCard**

Melissa L. Finucane, Dan Milech & Murray T. Maybery  
The University of Western Australia, melissa@psy.uwa.edu.au

The use of 'process-tracing' techniques for examining individuals' decision strategies has been criticized widely for yielding results that are uninformative and often confounded. The present paper describes a new technique based on a 'structural' approach that allows efficient assessment of finely discriminated decision strategies via a HyperCard program called 'DECOUT'. An experiment using the program is described, and possible directions for future research and development are discussed.

### **The SMAC Interface: A Data Collection Tool for Investigating Sequential Multiattribute Choices**

Gad Saad  
Concordia University, gadsaad@vax2.concordia.ca

The SMAC interface is a process-tracing tool for investigating behavioral patterns in an optional stopping task. Subjects choose between pairs of competing apartments to rent for one year. They make 15 such binary choices in a given session. For each of the choices, subjects decide when to terminate the search process, which attributes to acquire and in what order, when to go back and review previously-acquired information and finally which information to review. SMAC runs on any Macintosh model which uses system 7.0 (or higher) operating system . The source code was written in ThinkPascal 4.0.1.

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## **Auditory & Visual Analyses**

Chaired by: Doris Aaronson  
New York University

### **The Alignment Framework for Data Visualization: Relationships Among Research Goals, Data Types, and Multivariate Visualization Techniques**

Yu, Chong Ho & John T. Behrens  
Arizona State University, alex.yu@asu.edu

This paper suggests that a successful data visualization is a result of proper alignment of visualization technique, research goal, and data type. An empirical study was conducted to verify the preceding notion. In this study performance was evaluated under the combinations of three graphical formats (2D plot, 3D spin plot, and 3D mesh surface), two research goals (spotting outliers and examining relationship), and three datasets (small, medium and large sample size). It confirms the hypothesis that certain graphs are more effective in certain situations.

### **The Empirical Investigation of Factors Affecting Graphical Visualization**

Russell W. Jones & Ismael E. Careras  
Boston College, jonesru@hermes.bc.edu

An estimated 3 trillion graphs were published during 1994 yet little is known about what makes a graph most effective at communicating information to a reader. This is largely because of a dearth of empirical investigations pertaining to graphs. A major problem encountered by psychologists who wish to undertake sound empirical research into the effectiveness of graphical presentations is the shortage of suitable tools. This paper presents a computer software tool which offers the psychologist an inexpensive yet accurate and reliable method of performing empirical research into factors which affect the accuracy and speed by which a reader can interpret data encoded within a graph.

### **The Effects of Task Demands on the Equivalence of Visual and Auditory representations of Periodic Numerical Data**

Kimberly D. Turnage, Terri L. Bonebright, Dion C. Buhman & John H. Flowers  
University of Nebraska-Lincoln  
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Two experiments examined the equivalence of visual and auditory representations of waveform data. Multidimensional scaling of similarity ratings assessed the congruence between visual and auditory perceptions of several waveforms. A discrimination task provided a second, more sensitive test of visual-auditory equivalence. Results emphasize the importance of considering task demands when examining the equivalence of alternative modes of data presentation.

### **An Investigation of Data Collection Methods for Auditory Stimuli: Paired Comparisons versus a Computer Sorting Task**

Terri L. Bonebright  
Depauw University

Two studies were performed to compare data obtained from paired comparisons and a computer sorting task. The auditory stimuli in the first study were 18 graph representations and the second study used 30 sentences with emotional cues. Subjects were presented either with paired comparisons or were asked to perform a sorting task using a computer. MDS solutions suggest that the underlying cognitive structure among the stimuli is better represented by data from the sorting task.

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## **Symposium**

### **Multimedia in Instruction**

Organizers: Jim Kieley  
Miyazaki International College  
Paula Goolkasian  
University of North Carolina, Charlotte  
fpy00pag@unccvm.uncc.edu

In this symposium, multimedia is represented as an evolutionary rather than a revolutionary change in instructional technology. Among the topics covered will be basic software and hardware issues, assessments of the potential advantages of multimedia over more traditional methods of classroom presentation, support issues, distributing multimedia applications over computer networks, an evaluation of various multimedia authoring packages, examples of multimedia applications of relevance in teaching psychology and an overview of the future of multimedia.

### **Getting Started with Multimedia**

Paula Goolkasian  
University of North Carolina, Charlotte  
fpy00pag@unccvm.uncc.edu

This paper provides an overview of the symposium "Multimedia in Instruction" by addressing four basic issues--What does multimedia mean? Does it have advantages beyond traditional means of presentations in a classroom or teaching-lab? What equipment does one need? What software are available for psychology instruction. Although multimedia represents a revolutionary technology, its application to instruction is an extension of computer-assisted instruction.

### **My Teaching Assistant Is a Mouse: A Mid-Tech Use of Multimedia to Teach Perception**

Robert Sekuler  
Brandeis University  
SEKULER@Enga.Bu.Edu

Class meetings in my perception course are organized around a computer-based slide show. The shows, using inexpensive presentation software, comprise illustrative material, presentation notes, perception demonstrations, etc. Shows are uploaded to a campus network server from which they can be accessed by students for preview/review. I will discuss the conversion from traditional, unimedia format; how multimedia format alters classroom interactions; the impact on instructor preparation; and various tradeoffs made in getting a system running.

### **Selecting an Appropriate Multimedia Authoring Language**

Ellen F. Rosen  
College of William and Mary  
& Linda C. Petty  
Hampton University  
efrose@facstaff.wm.edu

This presentation will provide a brief overview of considerations involved in selecting a multimedia authoring language appropriate for the development of educational materials for use inside and outside the classroom. An evaluation system will be proposed and applied to a sampling of currently available multimedia authoring languages. Primary emphasis will be on Windows based systems.

### **The Nuts and Bolts of Multimedia Classroom Presentations**

James E. Gotsick & Priscilla S. Gotsick  
Morehead State University  
j.gotsic@msuacad.morehead-st.edu

This presentation focuses on setting up a system for developing and displaying multimedia classroom presentations which is both economical and relatively easy to learn. Four separate aspects of the process are considered: 1) a hardware configuration to serve both the development and display processes; 2) selecting authoring software and learning to use it; 3) presentation development including locating and acquiring multimedia resources appropriate to psychology, and; 4) some of the problems that can be expected to arise in both development and use of multimedia presentations. Some discussion of interactive courseware will be included.

### **Assessing the Effectiveness of a Multimedia-Based Lab for Upper-Division Psychology Students**

Adrienne Y. Lee, Douglas J. Gillan, & Charles L. Harrison  
New Mexico State University  
alee@nmsu.edu

The efficacy of multimedia-based training in producing increased learning was evaluated. Two multimedia software packages were compared with live or videotaped lectures on the same material. Results differed by type of student (low or high initial knowledge) and type of program. Multimedia training programs may need to provide more aid to students with less initial knowledge in the training domain. In addition, the effects of multimedia may be subtle and therefore require rigorous evaluation.

## **Multimedia: Where Are We Now and Where Do We Go From Here?**

James M. Kieley  
Miyazaki International College

This presentation will summarize the current state and future role of computer-based multimedia in psychology instruction. Recent success stories will be described along with potential obstacles which may confront enterprising multimedia users/producers. A new World-wide Web site archiving this information as well as other useful multimedia production and teaching resources will also be announced.

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## **Computer-Aided Methods and Statistical Analysis**

Chaired by: Russell M. Church  
Brown University

### **Correction of Errors in Scientific Research**

Russell M. Church, Brown University  
Charles E. Collyer, University of Rhode Island  
& Jonathon D. Crystal, Brown University

Three ways to reduce errors in computer-controlled experiments are: By tests of equipment and programs, by peer review, and by replication. This talk describes how each of these processes contributed to the identification of a serious error prior to publication, and provides additional evidence of the essential importance of replication for the identification and elimination of scientific error.

### **5th Generation Research Tools: Graphical Programming, Timing Verification, Multimedia Compliance, and Power Laboratory Custom Extensions**

Douglas L. Chute & Robert F. Westall  
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Software tools for creating psychological research protocols are "old" technology, unable to take advantage of fifth generation personal computers or desktop multimedia. Such tools have primitive graphics and problematic command-line, flat list, or forms based interfaces, requiring long learning curves and idiosyncratic programming. Many have inadequate accuracy in benchmark timing tests. Power Laboratory's graphical programming interface resolves such limitations and also provides an advanced, verifiable, millisecond accurate research tool that opens the discipline to multimedia as well as traditional stimuli. Various button, keyboard, mouse, touch-screen, and response options are provided along with external triggering and synchronization. Power Laboratory users have the option to link custom code extensions and a Web site provides for support and peerreviewed protocol and code publication.

### **Implementation of Nonparametric Multivariate Statistics with S**

Ching-Fan Sheu & Sue O'Curry

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Multivariate nonparametric statistical methods have not been widely used by psychologists. One of the reasons may be that the usual generalpurpose packages do not provide easy implementation of these methods. In this article, we briefly describe the multivariate extensions of the sign, signed-rank and rank-sum tests and use S, a programming environment for data analysis, to implement these statistical rocedures. Three numerical examples are used to illustrate the lexibility and efficiency of these computations in S.

### **Statistical Power in Complex Experimental Designs**

Drake R. Bradley, Ronald L. Russell  
Bates College  
& Charles P. Reeve  
Westinghouse Savannah River Company  
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Datasim 1.2 gives the researcher the ability to generate power and sample size tables for specific experimental designs. The tables parallel those developed by Cohen (1988) with some additional improvements: The user can control the values of  $1-b$ ,  $n$ , and  $f$  used to compose the rows and columns of the table, exact as opposed to approximate solutions are employed, and solutions for factorial designs take into account the actual  $df$  for  $MS_{error}$  (thereby avoiding the  $n$ -adjustment bias inherent in Cohen's tables).

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### **Laboratory Systems & Computer Simulations**

Chaired by: Drake Bradley  
Bates College

#### **An auto-adjusting shaping procedure for maximizing research time in training laboratory animals**

Fernando A. Gonzalez, Jeanne M. Stahl & Rodney A. Swift  
Morris Brown College

An automated system for sahping high level performance in laboratory animals is presented. Ten rats were placed on an auto-adjusting variable interval (VI) operant conditioning schedule overnight. In five work periods, with one-hour intervals between them, response requiriements were defined by a continuously adjusted VI schedule with requirements increasing or decreasing as a function of the subject's response rate during successive 30-s periods. All rats progressed from VI 10s to VI 120s schedules within six consecutive days of exposure, outperforming animals trained by traditional methods.

#### **Introductory Psychology Laboratories Using Graphic Simulations of Virtual Subjects**

Herbert A. Colle  
Wright State University  
& Randall F. Green

Stargate  
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Graphical simulations of the behavior of virtual subjects are being used to teach psychological research principles. A sense of behavioral "presence" gives students an appreciation of realistic behavioral observation and of testing methodologies. Modules were flexibly designed to foster exploration of hypothesis generation, planning, behavioral testing, and data summarization. Sample modules include: infant preferential looking (cognitive processes), courting behavior of fireflies, and personality test development and evaluation.

### **The PsyCLE Project: Developing a Psychology Computer-based Learning Environment**

Nick Hammond, Jean McKendree  
University of York  
& Peter Scott  
University of Sheffield

PsyCLE is a three-year project involving over 30 UK universities to develop multimedia resources for introductory psychology courses. Our goal is to support active learning and encourage students to form a sound understanding of concepts under study. The developments focus on interactive tasks, illustrative case study material and tools to support critical thinking and analysis. We discuss the rationale for the approach adopted, describe the developed resources and their evaluation and use.

### **ERTS-VIP: Tachistoscopic Color Image Displays on IBM PCs**

Jörg Beringer  
Berisoft Cooperation, Frankfurt, Germany

The new version of ERTS includes an enhanced VESA-based IPL-technique working in 256-color video modes in all available resolutions. Using extended features of Super-VGA cards, two full screen buffers can be realized for switching between high resolution color images within one retrace. Remaining video memory may be exploited as additional screen pages which may be displayed for as short as one screen refresh.

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## **Symposium**

### **Computer Attitudes and the Use of Computers in Psychology Courses**

Organizer: Margaret Anderson  
State University of New York, Cortland

This symposium examines a variety of ways that computers are being used in psychology courses: to conduct statistical analyses, to administer tests, to communicate with peers and faculty, and to program experiments. Following a description of each of these applications, the relationship between these instructional uses of computers and students' attitudes towards computers will be examined. This will include the relationship between students' attitudes and course performance as well as changes in attitudes resulting from the course experience.

## **Introduction and Overview**

Margaret D. Anderson  
SUNY at Cortland  
ANDERSMD@SNYCORVA.BITNET

The effect of including computerized instruction in psychology courses was examined at four SUNY colleges. This introduction will present a brief discussion of previous research as well as an overview of the design of the present project. This will include the selection of subjects, the choice of measures, and the methods of data collection. An outline of the specific research questions being addressed will also be presented.

## **Using an Interactive Computer Statistics Tutor to Augment Classroom Instruction In Behavioral Statistics**

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Students in a Behavioral Statistics course use the Statistics Tutor (Allen & Pittenger, 1991) software on any IBM compatible they like. They complete tutorial assignments on their OWN TIME outside of class on topics which complement lectures and other class "homework." The tutorials are "guided tours" through topics such as The Normal Curve, Central Limit Theorem, Power, etc. Students manipulate data sets or pictorial representations of concepts for their own understanding.

## **Comprehensive Course Management and Delivery Using POISE-CIS**

Peter A. Hornby  
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At SUNY-Plattsburgh we are using the POISE-CIS course management and delivery software to teach introductory psychology. The course, which follows a self-paced, mastery-based approach, is delivered over the campus network. Students receive assignments, take on-line diagnostic assessments, receive feedback, and communicate with the instructor using the network. In a departmental laboratory facility they work with a computerized tutorial, complete computerized learning exercises, and take supervised on-line exams.

## **Using E-mail and an Electronic Bulletin Board System to Support Collaborative Projects**

Margaret D. Anderson  
SUNY at Cortland  
ANDERSMD@SNYCORVA.BITNET

Students in Educational Psychology courses are required to use e-mail and electronic bulletin boards to organize group projects that are ultimately presented orally in class. Students are assigned to groups, and assigned a research article as the basis of their group project. They select related research articles, and subsequently post abstracts and receive questions from members of class on the bulletin board. Using the electronic communication media allows the instructor to monitor the students progress and evaluate individual contributions.

## **On-Line Computers in Psychology: A Laboratory Course for Advanced Psychology Majors**

David M. Sargent  
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This course is structured as a series of increasingly difficult projects which involve students in all aspects of using computers for experimentation. Projects range from programming simple experiments utilizing monitor displays and keyboard responses to the use of hardware interfaces to connect complex peripherals. Students not only design and develop their projects, but also engage in data collection. The course provides experience with software and hardware as well as the intricacies of debugging the resulting product.

### **Results and Conclusion**

Peter A. Hornby  
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hornbypa@splava.cc.plattsburgh.edu

The results of the research related to students' attitudes towards computers, the personality dimension of locus of control, and student performance in the four courses reviewed in this symposium will be presented. General findings as well as the relationship between specific types of computer experiences and the four subscales of the attitude measure will be examined. Important findings as well as implications of the results of this study will be discussed.