



Leonardo Electronic Almanac

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INTRODUCTION
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- < This Issue >

Craig Harris

As we announced last month we are launching another thematic thread in Leonardo Electronic Almanac 6:2, focusing attention on the intersection of art and artificial life. Guest Editor Ken Rinaldo has been working with us for several months to establish a significant endeavor that will find its way into LEA, and also into the pages of the hardcopy journal Leonardo. We have three installments scheduled so far, to appear between now and the end of the year, and we are hoping to hear from people doing a variety of work in this arena so that we can contribute to a critical discourse that both documents current activities, and fosters work and collaboration in the future.

LEA welcomes Michael Punt as the new Editor-in-Chief of Leonardo Digital Reviews. Michael will be bringing a new sense of direction to LDR in both electronic and hardcopy formats, and in this issue he provides us with his perspective on what needs to take place in the realm of reviews.

We are moving forward on our plan to install the subscription system for LEA on the MIT Press file server, and expect this transformation to take place with LEA 6:4. The text version of LEA 6:2 reflects some of this metamorphosis, providing excerpts from some of the articles for which full content resides on the LEA web site. This is partly due to the fact the size and nature of these articles makes it unrealistic to rely on text email distribution. We will continue to provide summaries of each new issue's content via email throughout the year, informing our subscribers of the content that will be found in the full LEA web journal.

Keep the content coming! We have a fabulous assemblage of material that we are preparing for publication in the next several months, and we are always looking for more.

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|  
| FEATURE ARTICLE |  
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< Technology Recapitulates Phylogeny (excerpts) >  
Kenneth E. Rinaldo

Kenneth E. Rinaldo  
Emergent Systems  
1821 West Hubbard, #205  
Chicago, Illinois 60622  
Email: <krinaldo@hotmail.com>  
URL: <<http://ylem.org/artists/krinaldo/emergent1.html>>

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Abstract  
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In this paper I will begin by discussing the issue of the machine and transformed vision. This will lead to the notion of "emergence" - a collapse of both scientific and artistic barriers which frame the rise of neo-biology within the art world. A discussion of artists who use biology as model and computers as material will lead into a description and discussion of artificial life art. This will be followed with comments about the changing nature of the work of art in relation to artificial life techniques and interactive art in particular. Later a few artificial life artists and their artworks will be mentioned.

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Excerpts  
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...Our constructed history both of art and science can trace a clear visual and therefore ideational path through the machine and its perspective. Perhaps it is a vestige of a sensibility created through the use of hand tools. Just as humans once probed into the unknown with primitive tools, for food or confirmation of reality, we allow the tool (machine) and its vision to replace our own. While the machine has both created and changed our vision, we have also created the machine, and it becomes as much a reflection of our desire, as a fluid distortion of our perceptions, and therefore artistic expression.

...Emergence is the new paradigm for a global change encompassing this earth. Artists, scientists, poets, theoreticians and researchers alike are no longer solely concerned with fields of pure research to the exclusion of other perspectives; they are instead concerned with the convergence and sharing of knowledge from all fields.

...Technology Recapitulates Phylogeny is an observation I've made which is a play on Ernst Haeckel's notion that "ontogeny recapitulates phylogeny," in which the ontogeny, or growth of the fetus in the womb recaps certain phylogenetic stages through which life has evolved. During gestation, humans progress from a single cell to a time when the fetus has rudiments of gills and a tail. Even before Haeckel's ideas surfaced, Aristotle believed there was an analogical relationship between organic history and human development. Pre-Socratic thinkers like Anaximander, Anaximes and Democritus postulated an analogy between cosmic history and human development.

...Certainly one of the more fruitful cross fertilizations of cultural emergence has been the mix of biological models with computers for the creation of evolving computer systems. Artificial life forms are now being produced by artists, researchers and scientists alike, forms which can learn and adapt to environmental changes. They can, as Darwin had defined in 1859, evolve through the processes of "natural selection." One form of artificial life program for instance uses genetic algorithms instead of genes for evolution. Artificial life programs consist of populations of simple programs, with no specification controlling all the others. These programs react to local situations in an environment or each other, with no global behavior controller, and the behavior evolves out of the all local interactions. So, any behavior which arises out of all these local interactions can be considered emergent.

...The machine, which has mutated into the computer and has transformed our collective vision, causes both lens aberrations and simultaneous sight extension, permitting the emergence of new forms. This collapse of individualistic, reductionistic, hierarchical sight has given rise to simultaneous world sense and therefore ideational plenitude. With this sense extension humans may for the first time be able to exploit models of living systems which demonstrate the possibilities for technology further recapitulating phylogeny. The hope is for a sustainable melding of our biological environment and the technotope. The new genre of artificial life art has already produced many exemplary poetic works with still others evolving. I for one look forward to the day when my artwork greets me "good morning" when it has not been programmed to do so.

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In this issue of LEA  
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[Ed. note: the URLs and the Biota.org work referred to below are available at the LEA website:  
<<http://mitpress.mit.edu/e-journals/LEA/>>.]

Eddie Shanken has written an article with multiple web links that dissects definitions of life and gets at the issues of "Life as we know it or life as it could be." Biota.org, an on line group using VRML to hatch worlds from human inputs, will also present their research and artworks. I have also included a brief description of an artificial life form "The Flock" that I created five years ago in association with Mark Grossman.

These works will begin to discern for the reader the vastly different approaches to A-life artworks and the philosophical implications of this work. They will be followed in a future issue of LEA in which Peter Beyls' use of artificial life programming techniques for the composition of music will be presented. In addition Yves Amu Klein's sculptural works which also use artificial life programming techniques to realize complex viewer interactions will be presented. Christa Somerer and Laurent Migneunneau will also present their work with artificial life in Leonardo Journal's next issue.

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Call for Input  
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A call for artworks, papers, research, historical perspectives, and pioneer profiles of: artificial life artists, scientists, researchers and historians. Please contact:

Kenneth E. Rinaldo

Emergent Systems  
1821 West Hubbard, #205  
Chicago, Illinois 60622  
Email: <krinaldo@hotmail.com>  
URL: <<http://ylem.org/artists/krinaldo/emergent1.html>>

Norbert Wiener, who coined the phrase "Cybernetics" as the "study of control and communication in animals and machine" set the stage for mathematician John Von Neuman who put forth that the basis for life is information and its subsequent evolution. The idea for the Cellular automaton was born. Still, the study of natural form has been around as long as the Paleolithic pigment drawings of Bison in the caves of Lascaux in Southwest France or Leonardo Davinci's studies of bats for the development of flying machines, which looked to natural systems as model, signalling a change from formal study to process concerns.

In 1987 Christopher G. Langton convened the first conference on "Artificial Life" and almost immediately it set off a flurry of new experimentation with artificial life techniques. At the front end of creation artists and researchers are setting the stage for works that self organize, evolve and virtually make themselves. Artificial life could best be described as the discovery and implementation of evolutionary software strategies in dynamic association with computer hardware and other environments, for the creation of "lifelike" behaviors and forms. This becomes a dynamic ever-changing, evolving collaboration with the machine and it's mimetic manifestations.

Individuals working "in silico" with artificial life techniques in sculptural form, installation, screen based, virtual environments, musical works, and historical perspectives are asked to submit their papers and artworks. Works that include evolutionary algorithms, genetic programming, classifier systems, Lindenmeyer systems, cellular automata, neural networks, autonomous-agents, subsumption architectures and new forms are especially requested.

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Artificial Life Artists  
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What follows is the beginning of a list of artists working with these particular areas. This will fill out considerably over the next couple of years as more artists and researchers working with artificial life techniques submit to LEA and Leonardo Journal and come to light.

Peter Beyls has been producing music using genetic algorithms as an alternative to pure human design as early as 1991. He began with cellular automata and is now employing genetic algorithms to realize original evolved musical compositions.

Nick Baginsky's "The Three Sirens," is an improvisational robot that uses unsupervised neural networks to learn rules about improvisation and instrumental virtuosity. They learn to control their motors and mechanical characteristics in which the feedback of the sound is further analyzed and creates a free improvisation of neural network composed music.

Yves Amu Kleins produces sculptural works inspired by Octopus behavior, and the growth of Fungi. These works exhibit complex adaptive behaviors triggered by human inputs and other Octofungi through evolving genetic algorithms set up by the artist.

Naoko Tosa's "Neuro Baby" is a work in which the participant induces a baby's head to react based on the tone of voice the system hears. Neural networks were used to decipher and understand these tones and

adapt by eliciting appropriate baby responses like crying or cooing.

Laurent Mignonneau and Christa Somerer have created "Interactive Plant Growing" in which five potted plants are used as input transducers, sensing the galvanic skin resistance of the viewer/participant which changed artificial life variables within the program to grow virtual plants on the screen. They have worked with Tom Ray as of late in the production of "A-VOVLE."

Kenneth Rinaldo and Mark Grossman have produced three robotic arms which react to viewers and each other with pulsed infrared eyes and microphone ears. They used telephone tones as an audible language to pass messages about viewer proximity and the movements of the other arms. They display an inorganic flocking behavior toward sound but away from human bodies, and were based on Rodney Brooks' Subsumption architectures.

Joseph Bates in association with 12 other researchers produced the work "Edge of Intention" in which animated creatures called Woggles interact with each other and with a fourth creature which is controlled by a user. These works present an on screen world in which the autonomous Woggles interact displaying emotions through facial and body language expressions, and develop complex interaction with both the viewer/participant Woggle, and the others on the interior world.

Since 1996, Biota.org, a consortium of artist/researchers have been creating a VRML testbed which allows users to plant a seed in cyberspace and begin an A-life simulation. "Nerve Garden I" uses fractal algorithms and a finite state machine to simulate 3-D worlds, and "Nerve Garden II," in process, will utilize neural network control of evolution in the new world with a generative engine called nerves.

Karl Sims has used a Thinking Machines Connection Machine and John Holland's genetic algorithms to create "Panspermia" and other artificial life works that create evocative and lifelike worlds.

Australian artist Jon McCormack has created "Turbulence," a CD-ROM based playback of virtual chimeras and synthesized forms created using artificial life algorithms.

William Latham is inspired by a fusion of natural history and science fiction. He produces organic forms using an artistic system based on natural geometry, which is implemented by a computer program called MUTATOR.

Tom Ray created "Tierra," a platform for the study of the genomic evolution of artificial organisms at the University of Delaware and the ATR Human Information Processing Research Laboratories in Kyoto. The evolution of Tierra machine-language computer programs proceeds without explicit direction or intervention from a human operator. Tierra represents a bottom-up approach to general A-life simulation.

[Ed. note: the complete content of this article is available at the LEA website: <<http://mitpress.mit.edu/e-journals/LEA/>>.]

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< Life as We Know It and/or Life as It Could Be: Epistemology and the  
Ontology/Ontogeny of Artificial Life (excerpts) >  
Edward A. Shanken

Edward A. Shanken  
Department of Art & Art History, Box 90764  
Duke University, Durham, NC 27708-0764  
Tel: (919) 688-6378

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Introduction  
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"...nature as described by our scientists is indeed an artifact built in collaboration with a Being sufficiently complex to mock and, perhaps, punish materialists by responding to them in a crudely materialistic way..."

- Paul Feyerabend, "Nature as a Work of Art"

Feyerabend's point is not that materialists are dim-witted and circular and get what they deserve, but that any given scientific explanation will be partial at best. It will function well in certain domains, and poorly in others - where alternative, perhaps incommensurable explanations, will do the trick. As a result, he likens the artwork of science to the constructions of Kurt Schwitters, such as the German artist's merzbild *Konstruktion für edle Frauen* (Construction for Noble Ladies, 1919) which the philosopher characterizes as an ad-hoc cobbling together of found objects in an amorphous structure. Noting that when "approached in different ways Nature gives different responses," Feyerabend concludes that universal explanations of nature-in-itself appear dubious. He proposes that science, which tends to search for unequivocal, unambiguous answers, could benefit from the arts, whose subtle understanding and appreciation of paradox and absurdity might complement what he calls the "(objective) artifact nature."

Implicit in the comments above is the idea that science is a hermeneutic rather than teleological endeavor. Artificial life, as the conjunction of biology and computational science, is likewise an interpretive discipline, one which - due to the domain of its inquiry and the nature and extent of its claims - raises many gnarly epistemological and ontological questions. For what is accepted as constitutive of life has great bearing on the understanding and experience of being.

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Excerpts  
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...For with regard to the understanding of life-as-we-know-it, I am concerned not just with his [Christopher Langton's] scientific goal of expanding insight into the physical, chemical, and biological qualities of life, but with the ways A-life research pushes the boundaries of metaphysics, and in so doing reveals insights into contemporary systems of value. A critical analysis of artificial life research programs may reveal as much about the epistemological and ontological biases of a particular cultural moment as the research itself does about the morphogenesis of prospective organisms. Nor are the two mutually exclusive, for combining these two levels of insight might create a self-reinforcing system of knowledge. In other words, a richer understanding of the constraints of current scientific and artistic methodologies affords more reasoned visions of the future, and these visions enable a subtler understanding of current constraints, and so on.

...As a segue into grappling with these ideas in the realm of art, Jack Burnham's "Beyond Modern Sculpture" of 1968 offers a useful history of the human infatuation with the creation of lifelike forms from non-living matter. The art historian begins a chapter entitled

"Sculpture and Automata," with Ovid's myth of Pygmalion, and works his way through the clockwork mechanisms of the Middle Ages and the Renaissance to the now legendary automata that Jacques Vaucancon created in the 18th century. These precursors set the stage for a section on "The Sociology of Modern Automata," and a later discussion of the fascination with machines and automata shared by artists before WWII, including Archipenko, Schlemmer, and Duchamp. Burnham concluded his book with the following prophecy: "In retrospect, we may look upon the long tradition of figure sculpture and the brief interlude of formalism as an extended psychic dress rehearsal for the intelligent automata... As the Cybernetic art of this generation grows more intelligent and sensitive, the Greek obsession with 'living' sculpture will take on an undreamed reality."

... A quarter century later, we may be in a better position to reflect on what has actually come to pass with regard to this prospective account of the future of art, and its relationship to artificial forms of life and intelligence. Do the works of contemporary scientists and artists experimenting with artificial life possess the "undreamed reality" Burnham imagined? In Ovid's words, to what degree do these latter-day Galateas "redden at the kiss" or "return a kiss unripe?" Will they prove to be "an embarrassment" for our time, as art historian Barbara Stafford claims Vaucanson's "sleight-of-hand in the name of experiment ...[was] to the Age of Reason?"

...What, if anything (beside funding) is the difference between artificial life research done by artists and that done by scientists? In this regard, it is interesting to note that Brooks, whose scientific research at MIT's Artificial Intelligence Lab has consistently been funded by the US military, participated in the Ars Electronica Genetic Art - Artificial Life symposium in 1993. But he recognizes little in common between his work and art. In contrast, Rinaldo, an artist who teaches in the Science and Mathematics Department at Columbia College in Chicago, and who along with Langton, Ray, and Sims, also participated in that same Ars Electronica conference, understands Brooks' robots as continuous with his own artwork, and would readily embrace them as art. Ray, to his credit, collaborates with artists and has drawn parallels between art and evolution.

...The working method of artificial life research, in contrast to that of the life sciences, is also a source of ontological confusion that is emblemized in the field's self-proclaimed and semantically imprecise title. In general, science has historically taken understanding natural phenomena as its goal. To do so it develops propositional theories and undertakes experiments to determine the extent to which nature corresponds to those theories. So, for example, biology takes expanding the understanding of life as the general goal of its inquiry.

...Research on artificial life proceeds in a somewhat different fashion. A-life begins with pre-existing explanations of life and complex systems from biology and mathematics, and seeks to reproduce variations on those themes. While it may claim to seek an expanded understanding of life, it does not perform experiments on living matter, but rather on theories about life. This is a crucial distinction. For it follows then that Ray's "Tierra" experiment, for example, takes expanding understanding of evolutionary biology - and not, it might be argued, life itself - as the subject of its inquiry. In this sense, artificial life is a misnomer because the phenomena being reproduced and studied are not life phenomena, but scientific theories.

...While I am skeptical of the epistemological and ontological claims of strong artificial life positions, I nonetheless believe that ultimately forms of life will be able to be synthesized from non-living matter in the lab and studio. Indeed, if replicable, the purported cloning of sheep and monkeys from living genetic material is a major step in that direction.

[Ed. note: the complete content of this article is available at the LEA website: <<http://mitpress.mit.edu/e-journals/LEA/>>.]

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PROFILE
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< The Flock >

Kenneth E. Rinaldo

Kenneth E. Rinaldo  
Emergent Systems  
1821 West Hubbard, #205  
Chicago, Illinois 60622  
Email: <[krinaldo@hotmail.com](mailto:krinaldo@hotmail.com)>  
URL: <<http://ylem.org/artists/krinaldo/emergent1.html>>

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The Flock  
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"The Flock" is a group of interactive sound sculptures that exhibit behaviors analogous to the flocking found in natural groups such as birds, schooling fish, or flying bats. Flocking behaviors demonstrate characteristics of supra organization, of a series of animals or artificial life forms that act as one. They are complex, interdependent interactions which require individual members to be aware of their position in relation to others.

The sculptural and musical flock consists of three independent rule-driven robots that interact with audible telephone tones. The tones are used as a positional language that allow them to pass messages back and forth about where people are in relation to the robots. They generally flock in the direction of participants voices unless they are too close. All the systems are standalone robotic controllers interacting to create one global behavior.

The key concept of the series is emergence, the coming together of systems with no central controller guiding their behavior. The global behavior is allowed to evolve naturally out of the local interactions among the systems. When the lower levels of the systems like self preservation are satisfied the higher functions like flocking are allowed to arise. The results are complex, chaotic, nonlinear and often lifelike.

When participants encounter "The Flock," they are drawn into an acoustic, kinetic and infrared network. By producing their own sounds and movements participants act in concert with the arms. Here the environment affects the form and the form modifies the environment, which then affects the form again, ad infinitum.

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Prior Art  
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Craig Reynolds has had much success with creating on-screen flocking behaviors with artificial organisms he calls "Boids." These simulated birdlike entities have been able to display complex group motion while avoiding obstacles and generally displaying computational flocking.

After setting out to create my own computer sculptures I discovered Ilhan Ihnatowicz had taken a step in this direction in 1972. He built a creature called "Senster," a computerized sculpture that was able to dynamically sense its environment and, under software control, modify its behavior based on past experience and current environmental inputs.

As Christopher Langton and other artificial life researchers have pointed out, a properly organized structure, need not be living or even physically embodied to display lifelike processes. By this token the Flock exhibits lifelike processes; and since it is a physical embodiment, it is subject to a far richer set of environmental stimuli and constraints than would a pure "in silico" organism. This helps bring the system dynamics into the realm where they can be better apprehended by participants.

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Hardware  
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Each arm is a jointed structure made of grapevines and bass wood, pulled into a tension/compression structure with steel cables and held together with a cyanoacrylate-based cement. The structure is outfitted with an array of four microphones, four 40 Khz infrared reflective proximity detectors, and a loudspeaker at the tip. The structure is anchored to a wooden box that houses four reversible DC motors each with an absolute shaft encoder for positioning. The motors activate three independent joints using a cord and pulley system much like that used in a radio dial. Above this box is the electronic control. The motors and sensors are connected to a custom built HC68010 processor. The audio circuit contains a telephone touch-tone (DTMF) receiver and generator for the intercommunication between the arms.

In "The Flock," the ceiling-mounted arms detect sound with their microphone arrays and movements of the participants with their infrared eyes. The responses depend on the personalities of the individual arms as they interact with the group (the other arms and the human participants). The software is designed to allow a wide range of learned and unpredictable responses, with an emphasis on cooperation to produce a group aesthetic.

The artificial creatures of the flock communicate among themselves with audible telephone tones. For instance, an arm can sing its position to all the other arms, allowing them to follow its lead. This tonal language permits the programming of various dominance-submission behaviors. The infrared proximity sensing allows a vocabulary of attraction and repulsion motions in response to the triangulated positions and movements of participants.

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Software  
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The controller software itself is organized as a collection of cooperating real-time processes communicating through a central behavior state structure. Each process is in charge of a particular sensor input or control output. The Behavior State Variables are the repository for information needed by the individual processes. Since the guiding principle is to create bottom-up synthetic behavior, each

state variable is for the most part accessed by only a single process. For instance, the influence of the shaft encoder positions over the motor speed is embodied in localized tables; the Audio Process adjusts its own noise threshold based on long-term average sound level; and the DTMF Process has enough intelligence to avoid publicizing its own tone output to the other processes. However, the Behavior Process makes use of a cross section of the available state data to guide the "personality" of the arm, and to integrate the diverse sensor data to arrive at a generalized "feel" for the environment. This state evolves in real time to produce a theoretically infinite variation in an arms reactions.

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Summary  
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By seamlessly integrating electronic and organic elements I am asserting the confluence and coevolution of organic and technological cultures. The branching and joining of the physical forms echoes the temporal flow of interactions within the flock. It is imperative that technological systems be modeled on the principles of general living systems, so that they will inherently fuse to permit an emergent, interdependent earth.

The three arms of "The Flock" were created by artist/engineer Kenneth Edmund Rinaldo and Engineer Mark Grossman. Currently Kenneth Rinaldo is working on "The Flock two." Special thanks to Joe Kennedy, Silicon Graphics engineer, for his original HC 68010 processor design for this project; and John Dawson for his support.

[Ed. note: the complete content of this article is available at the LEA website: <<http://mitpress.mit.edu/e-journals/LEA/>>.]

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< Biota.org (excerpt) >

Bruce Damers

Biota Working Group c/o  
Contact Consortium  
P.O. Box 66866  
Scotts Valley, CA 95062 USA  
Tel: (408)338-9400  
Email: <[damer@digitalspace.com](mailto:damer@digitalspace.com)>  
URL: <<http://www.biota.org>>

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Abstract  
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Nerve Garden was conceived in early 1996 as a VRML 2.0 technology test bed. This environment was designed to allow users to plant a seed in cyberspace. Nerve Garden I, demonstrated for five days as a hands-on installation at SIGGRAPH 97, achieved several milestones, including: the creation of a cross platform all-Java client server VRML 2.0 architecture; the generation of VRML using fractal algorithms; and the ability for users to place objects into a multi-user persistent VRML scene through a two stage 3D experience.

Nerve Garden II, currently under development, will broaden this test bed to encompass: neural network control of scenegraph evolution and behavior through an engine called Nerves, streaming of world geometry through the transmission of generative algorithms, not geometry; integration with a database to permit garden cloning and persistent storage; development of Nerves and NerveScript into a general purpose

behavioral and control mechanism for a broad range of VRML and Internet applications. Beyond providing core technology and methods to the VRML community, Nerve Garden may become a strong platform for larger scale shared object spaces for use in education, entertainment and research.

[Ed. note: the complete content of this article is available at the LEA website: <<http://mitpress.mit.edu/e-journals/LEA/>>.]

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LEONARDO DIGITAL REVIEWS
February 1998

Editor-in Chief: Michael Punt  
Executive Editor: Roger Malina  
Managing Editor: Kasey Rios Asberry

Editorial Advisors: Roy Ascott, Annick Bureaud, Marc Battier, Curtis E.A. Karnow, David Topper

Corresponding Editors: Roy Behrens, Molly Hankwitz, Bulat M. Galeyev  
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< Editorial: Leonardo Digital Reviews, A Martian View >

Written by Michael Punt  
Email: <[mpunt@easynet.co.uk](mailto:mpunt@easynet.co.uk)>

One of the most problematic issues that has become apparent in cultural theory during the last three decades has been the almost irresistible tendency to distance the object of study from the theoretical procedures used to analyze it. At its worst it has manifested itself in a pointless polemic in which theory and practice confront each other in an unseemly fight for the high ground. To be sure this is rare and is barely sustainable, but it is symptomatic of a general tendency for analysts to appropriate a cultural product in the public domain and to ring fence it in such a way as to exclude the very constituency of users and producers who might also reasonably lay claim to ownership. There have, of course, been responses to this tendency, not least in the area of discourse analysis, reception studies, ethnographic research, and the anthropological surveys of communities who were not, on the surface, natural candidates for such methodologies.

Almost without exception these so called bottom up approaches have shown that there is a greater complexity in the way that many cultural artifacts obtain meaning than abstract theory often permits. Bruno Latour, for example, argued that the discourses of science, looked at from the point of view of the behavior of scientists, might be understood better as a set of procedures which assert norms rather than reveal truths. Less mischievously, but no less provocatively, a number of writers have caused us to rethink our ideas about vision and

the visible by discarding the imperative of realism as the overriding determinant of technological change in the art and technology of imaging systems. In its place they have suggested that the corporeal pleasures these machines offered to users may have been more important factors in the development of these technologies and their subsequent cultural significance. These approaches have often breathed new life where there was apparently intellectual stasis.

No analytical methodology has a monopoly of truth nor do their exponents and arrayed supporters seriously make such claims. On the contrary, increasingly it is understood that there is value in this pluralism in resolving the sometimes intransigent deadlocks that arise from time to time in the most sophisticated and developed analysis. One can sometimes provide a 'Martian View' so to speak, of the other, asking questions from an alien standpoint which can often stimulate unexpected and creative leaps into new avenues of investigation. Leonardo Digital Reviews, with its interdisciplinary agenda and broad intellectual constituency, is well poised to make valuable contributions here. But perhaps the most challenging task it must face as the project unfolds, lies in its forms of publication. It reaches its readers through a variety of closely related but quite separate conduits ranging from the paper journal to the web.

Each subscribes to quite distinct discursive procedures, and each unfolds before the reader in very different ways - offering quite individual intellectual and corporeal stimulus. It would be tempting to hierarchize these along conventional lines in a league of seriousness in which the most abstract and enduring is the best favored. However if the critical potential of this diversity of delivery and reception is not to be squandered, more than ever, the former divisions between top down and bottom up approaches to criticism and analysis needs to be dissolved if they are to be reconciled without recourse to the unsustainable binary of abstract theory and practice. This may involve some unaccustomed combinations of discourses and practices which make different kinds of intellectual demands on readers and writers.

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< Journal Review: Discrete Dynamics in Nature and Society >

Discrete Dynamics in Nature and Society, an International  
Multidisciplinary Research and Review Journal  
Vladimir Gontar and Michael Sonis; Editors-in-Chief  
Gordon and Breach Science Publishers, 1997. Quaterly. 63 ECU

Reviewed by Roger F Malina,  
Email: <rmalina@alum.mit.edu>

"Discrete Dynamics in Nature and Society" is a new scholarly journal which seeks to "foster links between basic and applied research relating to discrete dynamics of complex systems encountered in the natural and social sciences."

The underlying hope motivating this journal is that the new sciences of complexity will provide a unifying mathematical framework for describing complex phenomena across the physical sciences as well as the social sciences- whether in economics, cultural development of cities, nations, evolution, human history etc. This grandiose holistic agenda is of course based of the breakthroughs in the last decade in various applications of non-linear dynamics, chaos theory and artificial life. According to the authors in this premier issue of a new journal there is not yet much basis for optimism: D. S. Dendrinos states "To the extent that the social mathematical chaos literature is concerned , all available statistical evidence presented to date is at

least inconclusive..." (p11); Author J.L McCauley states "Contrary to certain expectations and extraordinary claims, there is presently no evidence to suggest that abstract dynamic systems theory can be used to explain or understand socio-economic behavior" (p24). At the very least this new endeavor is being launched with a great deal of skepticism on the basic premise!

This new journal promises to be a primary resource for technical work in an emerging multidisciplinary field. Its founding raises two interesting issues:

The first concerns the mechanisms by which new scientific and social academic disciplines emerge within the social structure of scholarly research. The second is whether we need to re-think totally the structure of scholarly publishing given the development of hypermedia and intelligent search agent technology.

( This review has been abbreviated above. It can be found on line in entirety at <<http://mitpress.mit.edu/e-journals/Leonardo/ldr.html>> Choose "Issues"/ February 1998.)

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< Conference Review: The Future of Film Festivals >

The Future of Film Festivals:  
New Conditions in an Information Society: Ideas, Propositions, Debates

Conference held 27 - 28 April, 1997  
43. Internationale Kurzfilmtage Oberhausen  
Coordination of European Film Festivals

This brief pamphlet/document is a self-conscious presentation of papers given at this two-day film conference in Oberhausen from agenda to papers to participants (as part of the International Short Film Festival) on the subject of how New Media is influencing film festivals. The pamphlet is an adequate, though dry account of the conference content, which is important discussion developing in the film community over a period of several years regarding the future of film festivals. It includes a hefty list of sponsors and critics and makers from a dispersal of small film foundations in Europe such as the Bulgarian Cinema Foundation to inter Activa Video Fest in Babelsbourg, to Festival die populi in Firenze.

All in all over fifty small to middling organizations and festivals are listed in the back as participants, which means, that if you are not an attendee, but receive by mail the pamphlet document, you get a good idea of the breadth and scope of participation. Individual speakers include Prof. Dr. Manfred Dammeyer, Angela Haardt, Reinhard Wolf, Edgar Reitz, Joachim Polzer, Glorianna Davenport, Marcus Schonborner, Peter Kreig and Harmut Redottee.

Unfortunately, conference organizers exclude electronic data, like a URL or e-mail addresses from their publication (maybe there is no website?) and focus instead on major papers given at the conference, which range in content from festivals in the digital age, to digital subtitling for all European languages in the cinema of the future, MEDIAweb Television festivals on the internet and the future implementation of readily available mass technologies such as high-resolution TV and Surroundsound.

On the one hand the document gives the reader a good grasp of the discussion but there is no allowance for electronic networking or internet feedback on the material. The pamphlet remains a report. It could be a tool for broader communication. Somehow the mode of address

is too serious. One wonders how visual artists can avoid using any images. The printed piece is mainly devoted to transferring factual information and accounts, like a record, for persons who didn't make it to the conference or for those audience members who would like copies of the discussion.

Should we be so fortunate to go to Oberhausen, the conference is probably fascinating as this pamphlet is the first piece I have seen which covers so much material regarding new technology and its effects on non-mainstream cinema, thus the printed matter gives us insight to a growing scholarly and artistic conversation for festival directors as well as filmmakers and is well worth a perusal, if not an in-depth read.

Information is available from:  
Internationale Kurzfilmtage Oberhausen  
Grillostr. 34  
D-46045 Oberhausen  
tel. +49-208-8252652  
fax. +49-208-8255413  
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< Book Reviews: Twentieth-Century Design; and The Photograph >

Twentieth-Century Design  
Jonathan W. Woodham  
Oxford, England: Oxford University Press, 1997.  
ISBN 0-19-284204-8.

The Photograph  
Graham Clarke  
Oxford University Press, 1997.  
ISBN 0-19-284200-5.

Reviewed by Roy R. Behrens  
Email <ballast@netins.net >

These are new titles from an anticipated series of about 50 volumes in the Oxford History of Art, which will cover world art and architecture as well as less typical areas as Art and the New Technology, Art and Film, and Art and Science. In Woodham's design history, he allows little space for celebrated individuals, movements, or particular objects (which "change their meanings when used or viewed in different periods and places"), preferring instead to present an account of patterns of consumption, taste, and cultural significance, in the belief that "the most famous designs of the twentieth century are not those in museums, but in the marketplace."

Social context is also Clarke's focus in his overview of photography, although he is much more inclined to admit that photography has a history because of "a series of individual photographers who have been central to its development and who have produced what remain its definitive images." He begins with "What is a Photograph?," "How Do We Read a Photograph?," and "Photography and the Nineteenth Century," then embarks on a series of essays about subject categories: Landscape, the city, portraiture, the body, and documentary reportage. Both books include dozens of illustrations, a timeline, and an annotated bibliography.

(Review reprinted from Ballast Quarterly Review, Vol 12 No 3, Spring 1997)  
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< Book Review: Music in the World of Arts >

Music in the World of Arts  
M. Kagan,  
Press House "Ut"  
232p., St. Petersburg, 1996.  
ISBN 05-7443-0021-X

Reviewed by: Irina L. Vanechkina,  
Institute PROMETEI, KSTU  
K. Marx Str, 10, 420111,  
Kazan, Russia.

The author of this book is well-known to "Leonardo" readers. Some titles of his books are placed in the summary Soviet Bibliography of the special "Prometheus" issue of Leonardo (N.5, 1994). This journal published his article written specially for the "Prometheus" issue. For Russian theoreticians of art M. Kagan is known as the leading specialist in the field of aesthetics. One of his "sensational" books is called "Morphology of Art" [1]. It is devoted to classification of arts and their interrelation; the book has evoked a warm response among the scientific public of Russia (notably, e.g., B. Galejev claims to have derived his "periodic system of arts" based on the ideas by Kagan [2]).

Throughout this book Kagan emphasized the theme of musical arts. At the conclusion of the book Kagan promised to write its continuation in the future. Unfortunately, the book "Morphology of Art" was severely criticized in Soviet times by Party officials for its "bourgeois formalism." For this reason, Kagan failed to fulfill this promise during the seventies or eighties. Still even later, in the nineties there were difficulties, now financial. With all, he has recently finally managed (after a series of journal publications on this theme) to publish this long-awaited monograph "Music in the World of Arts." It is noteworthy that other researches in the USSR (Russia) were "on the alert" during the years after publication of the monograph "Morphology of Art."

In 1991 B. Galejev published the book "Light Music in the System of Arts" that is near to it in spirit but more local in theme [3]. At the very same time the two-volume educational manual "Music as a Kind of Art" by V. Kholopova was published in Moscow [4]. In her book, V. Kholopova considers music "from the inside and outside." He places emphasis on the relationships of music with other kinds of art both in the genetic and systematic plane. In the first, theoretical section "The Place of Music in the System of Arts" the author considers in full details the specificity of music, reasoning from the division of all arts into their spatial and temporal variations. Viewing music as one of the temporal kinds, Kagan considers it to be the first and the basic symptom (sign, property) that determines the ontological status of music. At the same time he believes that it will be insufficient for complete comprehension of music nature and that there arises, by virtue of this fact, the problem of its semiotic analysis (which will make it possible to determine the language of music as the sign system of "non-representational" character). In the subsequent separate chapters Kagan considers music as the "method of cognition of the human life spirit," as the "expression of man's attitude to the world." The special chapter is devoted to the analysis of genres of music. The second section of the book is of historical character; it is called "Changes of place of music in development of the world artistic culture." It treats separately such topics as "Origination and evolution of musical creation in syncretic art of antiquity," "Music in artistic culture of feudal society," "Music in artistic culture from Renaissance to Romanticism," and, finally, "Music in artistic culture of 19th and 20th centuries."

The last chapter is most closely approximated to ISAST interests; it traces in full details the functions of synaesthesia in musical creation, and, correspondingly, the synthetic trends that lead to light-music experiments, to mastering and revealing of new specific potentialities of music as applied to cinema, television, and the scene of new theatre. Also scrutinized are the results of technological revolution in music, which not only generates new genres (electronic, spatial, computer music) but influences also the language and content of music itself. Like many other theoretical works of M.Kagan, this publication is provided with a number of graphical schemes that make it possible to facilitate and systematize the perception of rather complicated texts of the author. Of large and, one may say, original independent value is the extensive bibliography of books on systemic analysis of musical art (both domestic and foreign publications in many European languages).

#### References

1. Kagan, M. Morphology of Arts, Iskusstvo, Leningrad, 1972 (in Russian).
2. Galejev, B. The New Laokoon: A periodic system of arts. - Leonardo, 1991, No.4, pp.453-456.
3. See reviews on this book: (S.Voronin in "Leonardo" (no.5, p.449, 1994) and I.Vanechkina in "Languages of Design" (no.3, p.286, 1993)
4. Kholopova, V. Music as a Kind of Art, in 2 vols., State Conservatory, Moscow, 1991 (second edition - 1994) (in Russian).

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< Digital Reviews Online >

Watch for these new features in the LDR web site at:

<mitpress.mit.edu/e-journals/Leonardo/ldr.html>

LDR Raw, entry point for reviews into Leonardo Electronic Almanac & Leonardo Print Journal, this area will allow visitors to see a full range of materials, as they are submitted from many sources.

Intersections with New Media series of articles and discussions. (Articles such as Molly Hankwitz on emerging issues in architecture and Thom Gillespie on hypertext and narrative; threaded discussion area slated to open March 15th)

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< Digital Review Notes >

Leonardo Digital Reviews is review journal published regularly as a section of the Leonardo Electronic Almanac. Leonardo Digital Reviews covers publications, conferences, events and publicly presented performances and exhibits. The focus is the work of artists, scientists, technologists and scholars dealing with the interaction of the arts, sciences and technology. Topics covered include the work of visual artists, composers and multimedia artists using new media and technologies in their work, artists dealing with issues and concepts from contemporary science, the cultural dimensions of science and technology and the work of scholars and historians in related fields.

Specifically, we publish:

- a) Reviews of publications in electronic formats (CD, CDROM, CDI, on-line, diskette, WWW, etc ...).
- b) Reviews of print publications, events, conferences, and exhibits

dealing with art, science and technology.

Accepted reviews will be published in Leonardo Digital Reviews. Reviews of key works will also be considered for publication in the Leonardo Journal and Leonardo Music Journal published in print by MIT Press. Selected reviews will also be republished in the Leonardo Almanac book published by the MIT Press.

Authors, artists and others interested in having their (physical) publications considered for review in Leonardo Digital Reviews should mail a copy of the publication to:

Leonardo,  
425 Market Street  
San Francisco, CA, 94107, USA.

Event and exhibit organizers, and authors of virtual/electronic publications and events interested in having their event reviewed should send information in advance electronically (only) to:

<ldr@msp.sfsu.edu>

Individuals interested in being added to the Leonardo Digital Reviews review panel should email (only) their curriculum vitae to:

<leo@mitpress.mit.edu>

We are particularly seeking reviewers who can review material in other languages than English.

Unsolicited reviews are not accepted by LDR.

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| OPPORTUNITIES |  
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< Ohio University School of Music Electronic Music Graduate Assistantships: 1998-99 >

Mark Phillips  
Professor of Music  
School of Music, Ohio University  
Athens, OH 45701  
Tel: (614) 593-4244  
Fax: (614) 593-1429  
Email: <phillipsm@ouvaxa.cats.ohiou.edu>  
URL: <http://ouvaxa.cats.ohiou.edu/~phillipsm/>

Deadline:  
March 21,1998.

Availability: It is anticipated that one or two awards will be given in Electronic and Computer Music for the 1998-99 academic year. Assistantships are limited in number and awarded competitively.

Stipend:  
May range from \$3750-7500 with a full or partial in- or out-of-state tuition waiver.

Duties:

Specific duties will vary depending on the qualifications and experience of the candidates. Duties may include the following: help supervise Macintosh-based MIDI lab, teach undergraduate and lower level classes in MIDI applications for musicians, perform routine maintenance, and create instructional materials and/or custom software. Time commitment is from 5 to 15 hours per week, depending upon the specific assignment and the amount of the award.

Degrees Offered:

Master of Music (M.M.) in Composition, History and Literature, Performance, Music Education, Music Therapy. Additional program of interest: Master of Arts (M.A.) degree combining Electronic Music with two other related fields, such as Audio (or Video) Production and Film available through the Independent Instructional Program (IIP).

Admission:

Admission is by application to the Graduate School and the School of Music. Applicants for the M.M. in Composition or the M.A. through the Independent Instructional Program (IIP) must submit a portfolio of their creative work. A personal interview is generally required for those seeking a Graduate Assistantship in Electronic Music.

\*\*\*\*\*

< Music-related Software/Hardware Engineering - NYCOR Search, Inc. >

Dani Snyder  
The NYCOR Group  
4930 W. 77th St., Suite 300  
Minneapolis, MN 55435  
Tel: (612) 831-6444  
Fax: (612) 835-2883  
Email: <danis@nycor.com>

NYCOR Search, Inc., located in Minneapolis, MN, is an established national search firm specializing in technical and engineering disciplines. We have been conducting successful searches for over 40 years!

We currently represent a client that manufactures interactive hardware and software that links any guitar to a Mac or PC so guitarists can play better, faster and with their software, print out what they play. Our client's development projects are 'cutting edge' and they are looking for talented and ambitious developers and engineers to join their team.

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Jr./Sr. Electrical Engineer(s)  
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Looking for someone with a B.S/M.S. in Electrical Engineering and one or all of the following qualifications: experience in digital circuit design, prototyping and testing, embedded programming, Intel 80C196 and/or the PIC line of micro-controllers, Audio filtering, DSP development, signal processing and music experience.

Will be responsible working on core product line that links MIDI drivers to hardware enabling you to connect your guitar to your computer. This allows you to see what you play and play what you see. This is truly interactive education and composition, and our companies' product is the only system that can do it.

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Visual C/C++ Software Engineer  
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Requires 2+ years experience writing Microsoft Visual C/C++ Windows

applications, or Codewarrior base Mac applications. Experience with VXDS and serial port devices a plus.

Be involved with developing software for Music educational products. For example: for composition, interactive lessons, games, artists library, etc.

This company offers a competitive benefit plan and excellent opportunities for growth!

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< Ryerson Polytechnic University - tenure track in New Media >

Professor Brian Damude  
Chair  
c/o Kim Kritzer  
School of Image Arts,  
Ryerson Polytechnic University  
350 Victoria Street  
Toronto, Ontario  
M5B 2K3, Canada

The School of Image Arts' New Media Program, of Ryerson Polytechnic University, invites applications for a tenure track appointment in the area of New Media Production. Duties will include teaching courses in Computer Graphics, Multimedia and Human/Computer Interface Design. Planning is currently underway for the development of graduate programs, incoming faculty may be expected to contribute this new initiative.

The successful candidate will have experience in New Media production including computer graphics, digital audio and video, and computer-based technology. The candidate will also have demonstrated excellence in the teaching and development of collaborative and distributed New Media works and have research interests in the history and theory of New Media.

Experience in the arts or arts-related New Media applications would be an asset as well as a knowledge of computer programming.

The starting date for the appointment is August 1, 1998.

Applications, including curriculum vitae, statement of interests, sample of works or reviews, and the name of three referees, should be addressed to the above address.

Applications received by March 9, 1998 will be assured consideration.

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< University of Florida - Electroacoustic Music and Music Technology Graduate Assistantships >

Dr. James Paul Sain  
Director of Electroacoustic Music  
University of Florida Department of Music  
130 Music Bldg/POB 117900  
Gainesville, FL 32611-7900  
Tel: (352) 392-0223 ext. 240  
Email: <jsain@ufl.edu>  
URL: <http://emu.music.ufl.edu/>

Several assistantships are available for Master's and Doctoral Students in electroacoustic music and music technology at the University of Florida. Assignments range from 25 to 49 percent load

for a salary between \$3000 and \$6000 for the academic year; a tuition waver is also granted for up to 9 hours per semester. Doctoral fellowships are also available to qualified students. Assistantships are available in the maintenance electroacoustic music studio and computer aided music instruction laboratory (knowledge of Macintosh OS required, UNIX a plus) as well as in the teaching of our introductory course in music technology (broad knowledge in internet applications, word processing, music sequencing, and music notation using Coda's Finale).

The University of Florida offers a wide selection of degree programs in theory and composition. The BA in Composition and Theory, BM in Composition, and MM in Composition are offered with both acoustic and electroacoustic options. The BM in Theory, MM in Theory, and PhD Music Education-Teaching of Theory Specialization, are also offered.

The Florida Electroacoustic Music Festival, now in its seventh year, offer students an opportunity to interact with an international gathering of composers. Students also benefit from the festival's composer-in-residence program that has hosted composers such as Hubert S. Howe, Cort Lippe, Gary Lee Nelson, Jon Appleton, and Joel Chadabe (1998). Concerts are presented in our departmental recital space, University Memorial Auditorium, and at our state of the art Center for the Performing Art Main Stage and Black Box Theater.

Faculty in composition, theory, and technology includes Dr. Paul Basler, Prof. Willis Bodine, Dr. Raymond Chobaz, Prof. Gary Langford, Dr. Leslie Odom, Dr. James Paul Sain, and Dr. Budd Udell.

We are excited about the future of composition and theory at the University of Florida. Please contact us if you are interested in studying composition, theory, and technology in a highly motivating environment. Letters of interest will the taken until March 31, 1998, or until positions are filled.

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ANNOUNCEMENTS
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< Artificial Life Conference - Paris >

Eric Bonabeau  
Santa Fe Institute  
1399 Hyde Park Road  
Santa Fe, NM 87501, USA  
Tel: (505) 984 8800 ext. 306  
Fax: (505) 983 0751  
Email: <bonabeau@santafe.edu>  
URL: <<http://www.devinci.fr/home/iim/vw98/vw98.htm>>

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Call for Papers  
First International Conference on Virtual Worlds  
Paris, July 1-3, 1998  
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In the last few years, there has been an increasing interest in the design of artificial worlds, using image synthesis, modeling, multimedia and virtual reality. In practice this approach is something broader and more fundamental. We can imagine virtual worlds reflecting

some parts of our reality, but also the synthesis of new universes with associated "physical" laws and artificial life forms.

This interdisciplinary conference aims to provoke new understandings of the important role that such virtual worlds will play in domains such as sciences, business, computer games, education, training, simulation, etc. It will investigate the relationships between the natural and the artificial from both theoretical and philosophical points of views. It will also address technical developments and practical applications. VW' 98 hopes to extend the scientific community by encouraging contributions from people involved in technical, philosophical and art works related to the design and applications of virtual worlds. The meeting will involve oral presentations, both invited and contributed, poster sessions, tutorials, debates, exhibitions and demonstrations.

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Topics:  
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Artificial and Virtual Worlds, Applications of Virtual Worlds, Synthesis of Virtual Worlds, Artificial Life, Artificial Realities, MetaWorlds, CyberSpace, Online Communities, Evolutionary Computation, Simulation of Ecological and Evolving Environments, Agents and Multi-Agents, Collective Behaviors, Emergence of Social Behaviors, Multimedia, Virtual Realities, Image Synthesis, Semiotic Issues, Philosophical Issues, ...

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| ACKNOWLEDGMENTS |  
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Editorial Address:

Leonardo Electronic Almanac  
718 6th Street SE  
Minneapolis, MN 55414-1318  
Tel: (612) 362-9390  
Fax: (612) 362-0097  
Email: <[lea@mitpress.mit.edu](mailto:lea@mitpress.mit.edu)>

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