



Leonardo Electronic Almanac

VOLUME 9, NO. 9
September, 2001

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ISSN #1071-4391

CONTENTS

EDITORIAL

by Roger Malina

< Artists and Scientists in Times of War >

FROM THE EDITOR'S DESK

< In the E-box >

LEONARDO JOURNAL

< Art Computer: Emphasizing Aesthetics in Computing >

by Paul A. Fishwick

< The Planetary Collegium Charter >

by Roy Ascott

FEATURED TEXTS

< Statements from the Burning Man Festival >

LEONARDO DIGITAL REVIEWS

< How to Build a Mind: Toward Machines with Imagination >

reviewed by Robert Pepperell and Curtis E.A. Karnow

ISAST NEWS

< The Spirit and Power of Water: Seminar and Concert >

< Call for Research Materials and Interview Subjects for Leonardo/OLATS
Pioneers and Pathbreakers Project on E.A.T. >

< Stephen Wilson Book-Release Party >

< Leonardo Co-Sponsors Workshop on Aesthetic Computing in July 2002 >

ANNOUNCEMENTS

< Harold Cohen's AARON Now Available as Shareware >

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EDITORIAL

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< Artists and Scientists in Times of War >

by Roger Malina, <rmalina@alum.mit.edu>

Some time ago, I was contacted by Leonardo co-editor Michele Emmer, who proposed a Leonardo editorial project on "The Role of Artists and Scientists in Times of War." At that time Michele found himself under the flight paths of bombers headed for Kosovo. As a result of Michele's initiative, Leonardo has published a number of articles by artists and scientists documenting their work that seeks to grapple with the continuing conflicts in our world. Contributions have come from members of the Leonardo network, from Colombia to Los Angeles, from Italy to Russia.

Today, I am writing this from my office in Marseille, and overhead I hear the bombers readying for action and warships are steaming for the Mediterranean. Marseille is a port city and has been for at least 2,600 years. This city has witnessed the warriors of innumerable cultures pass through, from Hannibal's elephants to the Third Reich's enforcers, from the Crusaders to Napoleon, from Roman centurions to Arab stallions. Now Americans and their allies are in a new war for minds and hearts, for bodies and resources.

I am the American Director of a French astrophysics laboratory. Last week we held our three minutes of silence and, like many of you, I felt emotionally reassured by the spontaneous outpouring of support and the cry "We are all Americans," echoing the rallying cry of "We are all Berliners" at the peak of the Cold War. Today I feel less sure of the reassurance. Are we all Americans? Or is this the wrong kind of categorization? I have no doubt the phrase "We are all Romans" was heard two millennia ago on these very streets of Marseille. And only 50 years ago, my father Frank Malina, founder of Leonardo, was one of the founding staff of UNESCO--a generation dedicated to building world organizations that would prevent the occurrence of a new world war. At that time we were all Europeans.

During the week of the atrocities in New York and Washington, we were meeting here in Marseille with American colleagues, discussing our dreams to build a new space telescope that would study supernovae, the largest of cosmic explosions, in order to understand the very forces that structure our universe. Nervously, we joked that the same telescopes we were imagining to unravel the mysteries of the newly discovered repulsive force (ironically called Dark Energy) could also be pointed down at the earth, and with sufficient resolution and sensitivity, track warm bodies moving around the surface of the earth.

We live in a highly linked system that has particular vulnerabilities. The crimes in New York and Washington resulted in thousands of victims and tens of thousands of displaced people. This is far less than the human losses in recent years in floods in Bangladesh or earthquakes in Turkey or China. Yet the attack in the U.S. triggered almost instant global reaction. The largest industry on the planet, the tourist industry, has seen a drop in business by a factor of several. Already layoffs and increased unemployment numbers in the hundreds of thousands in the U.S. alone within 1 week of the event. We live in a highly linked world. The same Internet that promotes diversity of opinion and

of analysis can also show global oscillations that manifest themselves as group-think and group instabilities. Whether in the bunkers of Camp David or the new Arab quarters of Marseille, each one of us is forced to analyze, to try to understand and decide what is an appropriate response. And in a highly linked network, a well-mobilized minority of the world population can lead to large-scale system response. And as we all know, inaction, lurking or listening in the network, is also part of the system behavior that will determine the course of future outcomes.

Since the attacks, the Leonardo editors, like all of you, have been in touch making sure that each is well, and bringing friendship to those who have experienced deep loss in the attacks. We thank all those who have contacted us and the Leonardo community, and we send our support to all those hurt and displaced.

Now the Leonardo network must decide an appropriate course of action. Michele Emmer is preparing a new editorial, updating "The Role of Artists and Scientists in Times of War" project. The Leonardo publications and projects belong to the Leonardo community. We are open to your ideas and thoughts on how we can all contribute to a saner and safer world that respects the rights and dignity of every person.

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FROM THE EDITOR'S DESK

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< In the E-box >

In the previous issue of LEA (Vol. 9, No. 8), we announced that Leonardo/ISAST had secured a U.S. trademark on the use of the word "Leonardo" in our areas of activity. However, we mused whether there was a way to open-source or "copyleft" the term Leonardo while protecting our copyright, since one aim was to help spread the ideas behind the metaphoric use of the word Leonardo. here is one response:

Dear Roger Malina and Leonardo staff:

Congratulations on establishing your trademark in the U.S. As a writer on the issue of saving "public goods" (see Not for Sale: In Defense of Public Goods, Westview Press, Boulder CO, 2000, Chapter 15, "Language as a Public Good under Threat: The Private Ownership of Brand Names"), I followed your case with interest. Roger Malina asks for suggestions in "copyleft" re: your new trademark rights. I suspect an answer within current law is that you may selectively issue licenses for use of the mark with whatever restrictions you choose. There might be a way to have a registration form on your website that would more or less automate the task of issuing licenses that would bind the licensees not to ever claim primary rights, nor to infringe the other holders of the Leonardo mark.

Best,
Michael H. Goldhaber
E-mail: <mgoldh@well.com>, <<http://www.well.com/user/mgoldh/>>.

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FEATURED
TEXTS

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< Statements from the Burning Man Festival >

[Following are statements by artists who have participated in the Burning Man Festival, an annual arts/cyberculture festival in the Black Rock Desert of Nevada. See LEA Vol. 9, Nos. 4, 6 and 8 for additional statements.]

The Ribcage
by Jenne Giles and Philip Bonham

The Ribcage is an evocation of childhood. Standing 17 feet high, it evokes the physical structures of both a ribcage and a birdcage. Like both, a pendulum swings in its core: the swing of a birdcage, the heart of a ribcage. This was intended as a project for the heart: as a participant swings in the chest, s/he literally IS the heart of Burning Man, the force that makes the living body of the event go. Therefore, context was extremely important to the conceptual force of this project.

Since Burning Man is about interactive art, we chose a difficult task: to construct a jungle gym that 26,400 people could climb on continuously over the course of the week. But for each participant, we wished to provide the following experience: The participant had to be able to climb entirely over and around the piece, walk through the belly region (under the sternum) and out through the spine, and up the ribs to sit in the swing, suspended high above the ground. Participants would feel small when incorporated into the body, with a 1:3 ratio of person to the piece. The swinging motion would simulate the beating of the heart, with a slow palpitation and breeze.

We hoped that in doing this, the participant would feel as if actually transformed into the heart. The project has a darker side too: instead of the exuberant, unrestricted movement of playground swings, which we all are familiar with from childhood, the swing of the ribcage is restricted by the size of the chest cavity, creating a sense of being incorporated within the body, a feeling of restriction as an embodied being. As participants look out through the ribs/sternum, the piece also conveys hope, just as a bird swinging and singing in his cage is a powerful symbol of eternal hope despite limitations.

The Ribcage was conceived as an autobiographical metaphor, growing, as it did, from the heart of true existence artists' relationship. It expresses the sense of nesting that we were building at the time. Conversely, it also became a metaphor for the cage of love from which we both needed to escape. It is rich, in retrospect, with the human drama played through its construction. But that is my experience of its birth and growth as the artist, of the life it took on in my eyes, and not of the carefree jungle-gym that most participants experienced.

The Ribcage is currently being reconstructed on private property with a sweeping hill before it, so that when one swings on it, s/he will feel that sense of suspension and flight. A garden will be planted around it and the structure itself will become a grape arbor, eventually bearing fruit from its bones.

Firefall

by Cynthia "Kiki" Pettit, E-mail: <kiki@kiki.org>, www:
<<http://burningideas.com/~firefall>>.

The Cauldron is a two-tiered fountain, like one in an Italian villa, but on fire. This "firefall" was inspired on a camping trip with my friend Leslie. He brought the camping gear and I brought the food and fuel for his camping stove. We filled the stove, but it would not light. We discovered that the new bottle of fuel I had bought was full of water---someone had used it up and returned it, filled with water. This was a blessing in disguise. We emptied the fuel from the stove into a paper cup and---having nothing to do and no way to prepare our food---my friend lit the fuel. It burned for a while, down to the level of the water, then went out. This was the summer of 1998. I then started doing experiments to see if I could maintain a flame on flowing water by continually injecting fuel under the water, and the firefall was born. After I had done this, I knew I had to build something larger for Burning Man.

Firefall water flows mirror-calm in a thin sheet over the lip of a bowl, with yellow flames swirling across the top and sheets of soft, blue flames chasing up and down over the edge. The top bowl is at an easy height for people to scoop up the flaming water in their bare hands. A small amount of fuel is added just beneath the water, rising and spreading, like a drop of oil, very thinly across the surface. Once the fuel is lit, the water itself appears to be on fire. Fuel is continuously pumped to the top to maintain the flames, and the remainder of the fuel is burned up at the bottom so that none is recirculated with the water. One can hold the flaming water in one's bare hands, because the water comes between oneself and the fuel, giving protection.

The Cauldron is the largest firefall I have built. It is 6 ft wide at the bottom and stands just over 3 ft tall. It holds approximately 450 gallons of water, all told, and has a gas-powered water pump that recirculates at 15,600 gph (gallons per hour)---nearly 4 gallons a second---through massive, 3-in diameter hoses and pipes. It burns five gallons of camping fuel, or naphtha, in a couple of hours, and can heat the water to the point of its being too hot to hold in about three hours.

Using found items both to realize my vision and to drive it, I scoured such diverse sources as industrial salvage yards, agricultural equipment distributors, petroleum wholesalers and residential landscapers. The Cauldron was built for Burning Man 1999 and has returned to Burning Man every year since.

For safety reasons, I light the Cauldron only at night---the small blue flames are too difficult to see in the day in case of an emergency. Once lit, the fuel is adjusted so that the flame stays lit at the top (for aesthetic reasons) and below (to continually burn off all extra fuel). Because people interact with the firefall, at least two spotters make sure that people's hair and costumes are tucked away, although there have been no incidents in over two years and over 30 hours of run-time at Burning Man and elsewhere.

Though The Cauldron may seem big, it is dwarfed by the vast playa at Burning Man. When lit, the crowd around it is close and quiet. People are drawn in and often do not leave until the fuel and water pump are shut off for the night. Unlike other large, explosive, in-your-face fire art at Burning Man, The Cauldron firefall invites people to touch the flames in an intimate and personal way.

< Art Computer: Emphasizing Aesthetics in Computing >

by Paul A. Fishwick, University of Florida, E-mail:
<fishwick@cise.ufl.edu>

I recently finished teaching a class on *aesthetic computing*, with the express purpose of exploring the use of artistic methods and processes within common representations found in computing. Computer science employs a wide variety of modeling types for portraying information and algorithms. For example, finite state machines (FSM) represent discrete phases for a natural or artificial process and entity-relationship (ER) diagrams represent how information is connected via entities, attributes and relations among these.

There are many motivations behind aesthetic computing, with the primary one being the ever-increasing trend toward personalization in all products, including human-computer interfaces. Mass customization is affecting not only the array of individualized products afforded by rapid prototyping fabrication and other advances in manufacturing, but also re-presentations of media. Since representations for computing are forms of media, there is ample opportunity to investigate how personalized interfaces and model structures can be used to build alternative views of phenomena and software. If the economy of labor and production permits us to construct both virtual and augmented constructs as easily as typographically oriented, flat media, then we are on the brink of a revolution in how we think about models for computing and, ultimately, representation in mathematics. We did not choose flat artifacts such as paper because they served as ideal repositories for conveying knowledge. Instead, they were chosen out of purely economic reasons, and with the introduction of the computer, the economies have shifted significantly to permit us to return to ancient forms of representation (albeit in virtual or augmented forms), as well as to generate new ones.

The aesthetic computing class had 10 students, all of whom are enrolled in the relatively new Digital Arts and Sciences (DAS) curricula. DAS students can be enrolled either in the College of Fine Arts or the College of Engineering. While my students happen to come from engineering, all students take a common pool of courses from both colleges, and in their junior and senior years, they take digital world production studio classes to facilitate work in teams. A good deal of what transpired in the 15-week class is stored on the web. I lectured for several weeks, and students each gave talks. Invited lecturers from art, music, English (new media) and information technology provided needed injections of fresh ideas. Students were required to take specific computing models and translate them into aesthetic, personalized, expressions. The two primary end products of their labor were physical and virtual models. The physical model was, as it sounds, a multimedia sculpture or architecturally oriented piece, and the virtual model was built in software using tools such as VRML, 3D Studio MAX and Flash. The physical model serves the following purposes: 1) an artwork capturing the semantics of a computing model, 2) a tutorial device for teaching modeling, 3) an architectural model for future actualization and 4) a prototype for a future tangible user interface

with physical components being used to construct the computing model, which is *sensed*, identified, and automatically input to a computer. The virtual model had similar purposes to the physical, but emphasized attributes hard to achieve with physical materials: interaction, dynamics and world navigation.

With such a new subject, the students and I discovered new ideas and incrementally forged a methodology for aesthetic computing. Since the students are hybrid artists/engineers, I found it easy to talk about the philosophy and principles underlying semiotics, analogy and metaphor; however, we ran into a snag in the application of the metaphor. The use of metaphor plays a crucial role in taking existing computing model representations and extending these into a more exploratory, aesthetic medium. Ideally, some time in the future, one might imagine building computing models, directly from scratch, using artificial buildings, landscapes, people, and off-the-web-shelf objects. But, we must begin with what we know and extend ourselves into the new domain. Thus, metaphor was carefully applied with clearly enunciated source and target structures to allow students to begin with known model representations in order to generate target aesthetic ones. For example, one might begin with a flowchart (a type of source computing model, representing control flow), invent a target metaphor style (say, landscape architecture) and then specify the formal mapping from source to target.

The snag was one where many students applied the metaphor but without any rules. An example of this would be mapping a specific software flowchart to a particular scene from Shakespeare's Hamlet. While this is a valid mapping, and fascinating as a project, there are no rules that allow for a more general engineering framework. An example of a rule might be "Decision Blocks in the flowchart shall be mapped to stage locations in a Play." This rule allows people to more easily understand the semantics of the flowchart in the target theater domain without specifically knowing Hamlet. It may be that these rules assist in communication and facilitate faster modeling, whereas a dearth of rules promotes a more secure, encrypted, model. So, both mapping approaches may see their uses.

Overall, the class was a great success and a lot of material was presented and absorbed on both sides of the pedagogical fence. There are a number of issues remaining, and many valid, mind-probing questions such as 1) How do we tackle the cultural dilemma of going from flat typographical representations to more aesthetic ones?, 2) Will communication suffer as we promote a personalized Tower of Babel?, and 3) When will the tools catch up to where it will be practical to use these sorts of aesthetically-inspired models over today's Platonically oriented, aesthetically-challenged representations? Still, if we ask ourselves how we might have evolved language, mathematics, and computing 4000 years ago had we owned a Holodeck, I very much doubt that we'd be representing our world using compressed, dead plant matter. We have a long way to go, and it is now time to pay more attention to aesthetic computing---using art to remake technology at its very roots.

Editor's note: Leonardo is co-sponsoring the workshop on Aesthetic computing being organised by Paul Fishwick. See Below for further details and at <http://www.cise.ufl.edu/~fishwick/cap6836/ac.pdf>

< The Planetary Collegium Charter >

We are pleased to republish here the Planetary Collegium Charter by Roy

Ascott as part of the Planetary Collegium project he leads for Leonardo. In this project Leonardo seeks to document and stimulate new thinking on educational structures and approaches that re imagine how we learn and teach. Just as in the middle ages the University emerged as an institutional construct given certain social and technological constraints, so the Planetary Collegium seeks to image new possibilities within today's social and technological context.

The Planetary Collegium Charter

by Roy Ascott, E-mail: <roy@caiaa-star.net>

The conceptual scheme of the Planetary Collegium starts with the recognition of its trans-disciplinary nature, at once poetic and pragmatic, located beyond the limitations of the university where, in general, only multi-disciplinary and inter-disciplinary projects can be achieved.

This trans-disciplinary perspective brings into a holistic field of inquiry the parameters of art, science, technology and consciousness research.

The Collegium is concerned with advanced research, generally undertaken by mature practitioners and theorists whose work (as a prior condition of fellowship in the Collegium) constitutes a significant contribution to the advancement of the field.

Applications of the research are found in those areas of the arts and technology, media, cultural policy and education that are user-centered, participatory and open-ended.

The Collegium constitutes a community of researchers linked in a planetary network but grouped in regional hubs. The network affords global interaction at the cutting edge of communications technology, while the hubs provide focused meeting places for research activity.

Collegium researchers typically work in a constructive and interactive mixed reality environment, addressing issues of the post-biological culture, challenging the orthodoxies of mind and body, space and time, along with their social and metaphysical paradigms, and building new systems and structures for the future.

The Collegium is dedicated to researching the means by which new meaning, perception and experience can be created from human interaction and collaboration within innovative systems and creative contexts.

The Collegium finds its transdisciplinary practice and theory at the confluence of a wide diversity of research streams where, for example, digital systems, molecular biology, neuroscience or nano-technology meet with media arts, ethnobotany, linguistics, cultural anthropology, urban design or astrophysics.

Research work requiring for its realization capital-intensive technologies is undertaken at sites external to the Hub, for which the Collegium is not liable, and with which an individual researcher is personally contracted.

The Collegium's research community develops discourse, behaviors, attitudes, relationships and values that reflect and in turn affect the processes of transdisciplinarity and environmental hybridization.

To maintain the rigor and quality of research at the highest level, and to ensure cogent, critical and creative dialogue, the community of

researchers in any one region will be necessarily small and compact.

Building on the model and research methodologies developed at CAiiA-STAR (<http://www.caiia-star.net>) each hub-group of researchers will meet at a succession of other hub locations around the world, thereby exchanging and generating a wide range of strategies, outcomes and values.

The Collegium research is pursued typically at the doctoral and post-doctoral level. Where outcomes are recognized by the award of a Ph.D., the appropriate university will have validated, and financially invested in, the Collegium program. Outcomes can similarly be recognized, in tandem with the University Ph.D. or separately, by a self-standing Collegium award.

The Collegium anticipates that its own award will equate with, or eventually supersede, the university Ph.D. as the recognized qualification in its field of transdisciplinary inquiry and practice.

Whilst each hub will reflect architecturally and culturally the particularity of the region in which it is situated, the size of membership, organizing principles and operating procedure remain the same throughout the Collegium as a whole. In every case, a diversity of persons, practices and objectives will be maintained.

The Planetary Collegium thus seeks to address contemporary issues with future visions while building on insights of the past, however distant or exotic, and to discover and develop new approaches to creative work in ways that traditional institutions are unable to accommodate or support.

The Collegium will be the advocate for change and transformation at many personal, social, cultural and environmental levels, and will seek support, through direct funding or collaboration, from those agencies, local and global, dedicated to similar ends.

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LEONARDO DIGITAL REVIEWS 2001.09

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We are pleased this month to welcome to the LDR reviews panel a new reviewer---Elisa Giaccardi, from the Fitzcaraldo Foundation. Her review of Arnold Pacey's book, *Meaning in Technology*, touches on the main themes of the material that we are covering this month: the collision of technological and visual culture. This seems to be symptomatic of an important focus at the moment and we are pleased to be able to offer two substantial accounts of the book *How to Build a Mind: Toward Machines with Imagination*, by Igor Aleksander, alongside a reflection on the state of the methodologies and claims of visual culture by Sean Cubbit. David Topper's review of *The Science of Illusion* reiterates the theme as he evaluates the book relative to our constituency and also points us to another text, Robert L. Solso's *Cognition and the Visual Arts* (MIT Press, 1996), which he values highly. Wilfred Niels Arnold's assessment of Martin Kemp's *Visualizations: the Nature Book of Art and Science* points out some lack of depth in an otherwise refreshing

collection of material on the shared perspectives of scientists and artists that addresses the topic more generically. According to Curtis E. A. Karnow, *The Shattered Self: The End of Natural Evolution*, by Pierre Baldi, tends to veil the cultural construction of the relationship between science and its impact in an otherwise comprehensive argument concerning the future of molecular biology.

Elsewhere, Nicola Triscott has given us a walk-through of some of the events currently included in the Venice Biennale while reviews of films, CDs and other events (listed below) can all be explored at the LDR website. As ever, LDR is grateful to the panel of reviewers, whose biographies are listed on the site, and to Sudhira Hay, Bryony Dalefield and Kathleen Quillian who make it all work in their respective ways.

Michael Punt
Editor-in-chief, Leonardo Digital Reviews: ldr@leonardo.org

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New this month at Leonardo Digital Reviews, September 2001
<<http://mitpress.mit.edu/e-journals/Leonardo/ldr.html>>:

The Science of Illusions, by Jacques Ninio
Reviewed by David Topper

Material Legacies: Bamboo, edited by Enrique Martinez and Marco Steinberg
Reviewed by Kevin Murray

Visualizations: the Nature Book of Art and Science, by Martin Kemp
Reviewed by Wilfred Niels Arnold

How to Build a Mind: Toward Machines with Imagination, by Igor Aleksander
Reviewed by Robert Pepperell

Practices of Looking: An Introduction to Visual Culture, by Marita Sturken and Lisa Cartwright
Reviewed by Sean Cubitt

How to Build a Mind: Toward Machines with Imagination, by Igor Aleksander
Reviewed by Curtis Karnow

The Shattered Self: The End of Natural Evolution, by Pierre Baldi
Reviewed by Curtis Karnow

Meaning in Technology, by Arnold Pacey
Reviewed by Elisa Giaccardi

Constructivism Laboratory, by A. Lavretiev
Reviewed by Ekaterina Lavrentieva

An Aesthetics from Below and Aesthetics from Above - Quantitative Way of Rapprochement, by Y.N. Rags
Reviewed by Alexander P. Mentnyukov

Playtime by National Health and Barcode Music, by GYnter Schroth
Reviewed by Robert Pepperell.

The Plateau: View from the High Plains of Art, Venice Biennale 2001, 10 June - 4 November 2001
Reviewed by Nicola Triscott.

Prometheus-2000: On the destiny of Light-Music at the Threshold of New Century International Conference, 2-6 October 2000, Institute "Prometheus," Kazan, Russia
Reviewed by V. Basov.

How to Build a Mind: Toward Machines with Imagination

by Igor Aleksander (Uncorrected proof). Columbia University Press, NY. U.S.A. 2001. 192 pp., illus. b/w. \$24.95 ISBN: 0-231-12014-1.

Reviewed by Robert Pepperell. E-mail: <pepperell@cwcom.net>.

[For a comparative review of the same book, see Curtis Karnow's review following this one.]

It was fortunate that I was offered an uncorrected proof copy of How to Build a Mind to review just prior to attending the "Toward a Science of Consciousness" conference where both Igor Aleksander and I were to speak. It gave me the opportunity to discuss many issues arising from the book directly with its author in an atmosphere charged with debates about the very nature of consciousness. In reviewing this book I have tried to give the reader a sense of that atmosphere as well as a flavor of some of the debates themselves.

"Could a machine think?" pondered Ludwig Wittgenstein, just at the point in the mid-1940s when the construction of an "electronic brain" seemed theoretically possible. The broad implications of this question have fueled one of the most heated debates in contemporary thought - the nature of consciousness and how it might be mechanized. Igor Aleksander is no newcomer to the field or the debate. As this partly autobiographical book makes clear, he has been actively concerned with modeling the mind in machines since the early 1960s and is probably best known today for his work with neural networks at Imperial College, London. Since then, he has been writing prodigiously on the subject of artificial intelligence, with many books and respected papers to his name. How to Build a Mind is clearly an attempt to popularize a subject that, to many outsiders, is technically and philosophically complex. But the book is also intended as a serious intervention in the debate from someone who, despite the technical focus of his work, seems to want to frame the "hard" problem of engineering a mind in the "squidgier" problems of human experience, philosophy and, in particular, the imagination.

First we discussed my concern that the main title could be regarded as, at best, over-optimistic or, at worst, misleading with its echoes of some unfortunately titled books such as Daniel Dennett's "Consciousness Explained." One senses the pressures that commercial publishers exert in the interests of stoking controversy and gaining attention. It seems that Aleksander would be more comfortable with the less emphatic subtitle "Toward Machines with Imagination," a title that certainly summarizes the aim of his current research, although some may argue even the claim implicit in this phrase is premature.

Aleksander makes the point early in the book that he wishes to shift the locus of the discussion away from the concept of consciousness towards the idea of imagination. He is looking for the "force of consciousness in the power of the imagination. I need to understand how my brain, an evolved machine of awesome complexity, can provide me with not only pleasurable reverie but also all the other elements of my mental life." (p. 2). This extract characterizes what perhaps is unique about Aleksander's approach. He offers a combination of pragmatic

mechanism, derived from his background in engineering, with a profound respect for, and curiosity about, the more ephemeral aspects of human existence such as art, philosophy and mind. He is critically aware of the pitfalls and blind-alleys into which discussions about artificial intelligence can stumble and his own position, evolved over years of research and contemplation, is lucid whilst not overly prescriptive. For example, he agreed with me that cognitive science has led some researchers to confuse the thing being modeled (the brain) with the model itself (the computer). But he is also clear about the advantages of the methodology of modeling the neural functions of the brain in software: "We use computers to get to grips with the complexities of neural structures in much the same way that a weather forecaster uses computers to get to grips with the complexities of the weather. Nobody complains about the latter on the grounds that 'computers cannot be the weather'; they only complain if it rains when fair weather is forecast." (p. 172). In the same way that meteorological models might be able to predict hurricanes and save human lives, he argues neural models may have medical applications that help to relieve human suffering. Much of the work he currently does is funded by the Wellcome Trust medical foundation with a view to potential treatment of neurological disorders.

I pressed him on some of the more ethically troubling questions that have been implicated in AI research over the years, particularly the involvement of the military and the extent to which we are willing to hand over responsibility to machines for their own conduct. He offers an entirely practical constraint on the "out of control" scenario in which researchers might design machines that are no longer accountable to human operators: "I think that would be thoroughly irresponsible and, in fact, it would be against standard industrial engineering legislature. Anything that has the ability to interact with humanity has to be certified. This is the argument I always have with Kevin Warwick. He says things can get out of hand. Maybe you don't want to relinquish responsibility but they [the military] will take it away from you, they'll build these things that will go around killing everybody. Now, the military do have a mandate to build things that kill people, but that has its own legislature. If they wanted to destroy Moscow it would be far more difficult to build a conscious robot to do it than just drop a missile."

One of the most contentious questions addressed during the conference was the location of consciousness - more specifically whether or not it was located in the brain, or the degree to which it might be so. Many of the eminent invited speakers who addressed the question were emphatic that consciousness is specifically a product of the brain and were swift to dismiss alternative views. However, there was a significant minority that resisted this dominant position and the consequent arguments were, for me, amongst the most stimulating of the conference. The question seems to turn on the extent to which one recognizes anything other than the brain as necessary to consciousness, in particular the body (with all its sensory feedback) and the environment (with all its active stimuli). In other words, the brain is obviously a necessary condition of consciousness, but is it sufficient? Again Aleksander treads a pragmatic path between the two extremes of this debate. Although he does not address the question directly in *How to Build a Mind*, the book does contain a summary of his previous book, *Impossible Minds*, in which he is fairly explicit about the minimum conditions required for a conscious entity: "One of the pillars of *Impossible Minds* is that anything that is conscious must have some connection with world events or juxtapositions of world events." (p. 154). He is also aware of the flaws in the so-called "brain in a vat" model, which downplays or ignores the feedback between the brain and the body. Thus, in his current research aimed at building a realistic model of consciousness he is using programmed neural nets in active

robots in order to simulate the ongoing experience of an agent that is conscious of, and responsive to, a dynamic world. To my mind, such an approach puts Aleksander firmly on the "extensionist" side of the argument (although I doubt he would use the term). What's more, his emphasis on imagination also implies some sort of emotional or visceral constituent to consciousness, which in turn implies the co-operation of a functioning body. I suggested to Aleksander that his views were sympathetic to those who saw consciousness as a distributed rather than localized phenomenon: "I wouldn't have started talking about that by saying 'where is consciousness located?' but more like what does consciousness involve, or need, to exist. I see it as something that does emanate from the brain and to us our consciousness feels like a single point event in our head and then everything we experience out there, other people, political systems, whatever, is a way in which this thinking we do, which is just the firing of neurons, reaches out way beyond the confines of our brain. It's this 'out-there-ness' that I find totally fascinating. I don't believe in brains in vats."

Perhaps Aleksander's most original contribution to current ideas about machines and consciousness is his foregrounding of imagination, which provides the main thesis of this book. Thus he restates Wittgenstein's question "could a machine think?" as "can a machine imagine?" (p.3). He goes on: "The answer will not be revealed in the next paragraph or two but, hopefully, will begin to emerge by the end of the book." Whilst much of the book is concerned with sketching the historical, philosophical and technical context from which the AI debate emerges, the last few chapters attempt to attack the problem of consciousness directly with a theory of mind based on "ego-centeredness". For Aleksander this means a neural area in a brain simulation that "coherently represents the world from the point of view of the observer. This receives signals both through visual channels and from the muscular activities of the system, giving it the capacity to reconstruct objects as they exist in the world but as seen from the point of view of the observer. The ego-centered area represents the world as it appears to be as an extension of oneself" (p. 158). Without giving a technical explanation he goes on to claim that such an area is also capable of imaginative manipulation: "Indeed this system is capable of imagining a blue banana with red spots, even if such an object has never been part of its learning experience. The way in which this happens is that the words stimulate specialist sensor-centered areas that represent blueness, red spottedness, and bananeness, while the ego-centered world area does the rest." (p. 159). Hence the ability that some of Aleksander's research machines apparently share with humans of being able to "see things that are not there" or "things they have never seen". I asked him about the relationship between imagination and consciousness: "I see imagination as a major ingredient of consciousness. It's the most beautiful part of consciousness and it's the thing that I wanted to write the book about." Those outside the closed world of cognitive science should surely welcome this interest in the more aesthetic tendencies of human thought from such a prominent mechanist. Aleksander's machines (dubbed with names such as WISARD and MAGNUS) offer compelling evidence of the power of computer systems to mimic human behavior, even that which seems most un-computer-like. Perhaps what is less obvious to Aleksander's overall case as it is presented here is the role of language in this whole system and how words can give rise to pictures. He distances himself from Wittgenstein's early "picture theory of the mind" in which mental images might be seen as merely illustrating words (p. 169). Instead he offers a more comprehensive view of conscious experience, which might include all the other sensory qualities pertaining to a thing such as, for example, a "cup." But I for one am not convinced that the correlation between a verbal description and a mental image is as straightforward as the "blue banana" example might suggest. Contrary to what several speakers at the conference claimed, I am not able to close

my eyes and conjure up an image of a blue banana or a red lemon in anything but the foggiest way. I can certainly conceive of such objects but I do not perceive them as sharp, bright pictures in the sense implied by Aleksander and others. In order to experience a dream-like pictorial lucidity, it seems to me, one must be either asleep or in such as deep state of relaxation as to be almost oblivious to verbal stimuli. The obvious exception is waking hallucination, which is not directly addressed in this book but which might actually be closer to what is happening in the computer simulations described. As I raised this problem Aleksander mentioned the common example given by visual working memory psychologists that demonstrates that one can count the windows of one's house whilst attending to some other task, e.g. listening to a lecture. To do this one does not have to have a perfect depiction of the house since the fact of attending to the windows distorts the "picture" entirely. Yet I remain unconvinced that such "visualization" (which I'd prefer to call conception) is primarily a "visual process" in the sense implied at the end of Chapter 11, where Chris Koch and Francis Crick's work on the anatomy of the visual system is cited. It may be that such "visualizations" are as much linguistic constructions as they are apparitions in the visual apparatus. In neurobiological terms it would be interesting to look at any data pertaining to the quality of imagination of individuals who have impaired visual function and to determine whether or not, for example, they could complete a similar counting task based on experience of the sense of touch.

"How to Build a Mind" raised a number of other points that stimulated our discussion such as the limitations of digital systems for modeling reality, Zen theories of mind, feedback loops and internal states of networks, mathematical recursion and drug induced hallucinations. This is some indication of the fact that, although quite short, the book holds a great range of ideas and offers a rich set of possible connections to be explored. It is also reflective of the multi-disciplinary approach to the problem of consciousness that the conference itself was seeking to foster. Yet the book has structural weaknesses that, in my view, could have been minimized with more careful editing. In particular the regular insertion of imagined dialogues with philosophical figures is sometimes illuminating, as when discussing Kant (p. 81), whilst at other times strange, as when discussing Thales (p. 17). The last couple of chapters, which contain the bulk of Aleksander's current thesis, seem more compacted and opaque than the rest of the book, perhaps not surprising as he tries to present a complex set of ideas within a few pages. Setting aside these deficiencies, I felt that How to Build a Mind strongly reflected the author's mixture of pragmatism and inquisitiveness. This is not a book of philosophy yet it has, I believe, worthwhile philosophical implications. It is not really even a book about computers since, for Aleksander, the computer simulation is just a means to an end. Rather it is about purposeful inquiry into the nature of the human mind. As such it indicates the extent to which our thought is currently understood, and more importantly the much greater extent to which it remains unknown.

How to Build a Mind: Toward Machines with Imagination

by Igor Aleksander (Uncorrected proof). Columbia University Press, NY, U.S.A. 2001. 192 pp., illus. b/w. \$24.95 ISBN: 0-231-12014-1.

Reviewed by Curtis E.A. Karnow, E-mail: <cek@sonnenschein.com>.

There are some books that tell us more than we want to know about the author and his or her investigations. How to Build a Mind is one of

them. It is irritating to be told, quite literally (p.9), that the message of the book is not comprehensible without tracing the author's "journey," including a rough and ready review of 2000 years of Western philosophy (in just under 90 pages---whew!), his various jobs, job interviews and people he has met along the way.

One excuse for this is that the subject of the book---whether machines could be said to have consciousness, or imagination---is more a question of losing our prejudices than advances in technology. Professor Aleksander (Imperial College, London) takes almost half the book to trace some thinking about consciousness from Aristotle to Wittgenstein to reveal these prejudices. He does so with ginned-up conversations with these folks, and later with a ginned-up radio interview with some of our contemporary experts on consciousness, such as Daniel Dennett and Roger Penrose. The conceit could be enough to waken an interest in these authors, but is too sketchy to be useful here.

Aleksander has an underlying pedagogical interest. His unremittingly self-centered meanderings are in aid of the thesis---revealed at the end of the book, a "denouement" to a "detective story"---that consciousness is nothing more than ego-centered world representation. This is exemplified by the emergent properties of neural nets that code the relationship of the perceiving thing to the world around it: a cup is not just a cup, but also what I might do with the cup, where it is in relationship to my physical body, what I might drink from it, and so on. In this sense, imagination and consciousness are two sides of the same coin. Consciousness is simply the representation of facts about the entity itself in the context of its physical world.

This is not much a detective story, and the spoiler here will not reduce the already most moderate impact of the book. There is no sustained discussion of "emergent" properties and how those differ from ordinary abstraction and short-hand (a "triangular" cloud, a "dangerous" crowd, a "valuable" collection of stamps). Aleksander gives examples of visually ego-oriented representations (machine input here: other things over there), but it is not a compelling argument that other aspects of mental processes that contribute to the sense of self could be handled in the same way. This is because Aleksander never argues his assumption that the (1) relationship between visual (or other sensory) perceivers and the objects of perception are similar in the relevant ways to the (2) relationship between mental entities and the objects of their desire, fantasy, fear, memory, fibbing and other story-tellings, and so on. Aleksander might be right in his assumptions that these latter relationships, tokens of consciousness, are not materially different than visual relationships, but we do not know that yet. This is a frustrating book, because the author has in fact done a lot of work with neural nets and artificial intelligence, but with the exception of a brief, very general description of an experiment some decades ago, little of his work appears here.

Nothing much works in this book: the conceit of its structure is tedious, and will convince no one that the author has hit on the relevant definition of consciousness. The discussion of past and present thinkers is thin gruel, not enough for readers who have read them, and irritating to those with some background. There is no "how to" in this, at all, despite the title, just gently vague ruminations. Sum, ergo sum. It is a book without an audience, save the reviewer.

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< The Spirit and Power of Water: Seminar and Concert >

Leonardo/OLATS, The River Festival and The Concerts of the MIM (Laboratoire Musique Et Informatique De Marseille) are pleased to present The Spirit and Power of Water at the Confluence of Arts and Sciences - a seminar and two concerts dedicated to the theme of water in the context of the arts and sciences. These events will take place 8 and 9 November, 2001, in Marseilles, France.

The seminar will feature:

Roger Malina - Camel Zekri and the River Festival - Jacky Bouju - Iba Ndiaye - Iba Ndiaye Diadji - Camille Talkeu Tounounga - Irit Batsri - Liliane Lijn - Nodoka Ui - Jocelyne Rotily.

The concerts and multimedia performances will include:

The River Festival - Lucie Prodhomme - Marcel Fremiot and Jacques Mandelbrojt

8 November: Seminar organized at the Vieille Charit , in the Center of the Ecole des Hautes Etudes en Sciences Sociales of Marseilles: from 2:00 pm to 6:00 pm. Admission free.

8 and 9 November, 2001 at 8:30 pm: Concerts performed by the River Festival and the MIM, at Auditorium de la Cit  de la Musique, Marseilles. Admission: 30 or 50 francs.

For more information on The Spirit and Power of Water, see <<http://www.olats.org/africa/avva.shtml>>

< Call for Research Materials and Interview Subjects for Leonardo/OLATS Pioneers and Pathbreakers Project on E.A.T. >

Annick Bureau, director of Leonardo/OLATS, is asking for research help in work for the Leonardo Pioneers and Pathbreakers project on E.A.T. She is particularly looking for people involved who would be willing to be interviewed.

Dear Colleagues,

The French Leonardo/OLATS project "Pioneers & Pathbreakers" <<http://www.olats.org>> is making significant progress. Sylvie Lacerte, a French-Canadian Researcher and Ph.D. Student of Louise Poissant, is going to write the Leonardo Pioneers and Pathbreakers notices for E.A.T, Kl ver and Rauschenberg. Sylvie will check the archive in Montreal (Fondation Langlois), in New York (E.A.T.) and the Getty Foundation. But we are all aware that archives, documents, etc. exist "somewhere else." If you have such documents or if you know anyone who has some, could you help Sylvie by giving her the contacts and, if possible, photocopies of the documents?

Also, Sylvie intends to do "video interviews" of people who participated in the E.A.T. adventure. If you were part of it, or if you know anybody who took part, please get in touch with her.

Sylvie's e-mail address is: <sylvielacerte@videotron.ca>

We thank you for your help.

Best regards,
Annick Bureau
Pioneers and Pathbreakers coordinator
<annickb@altern.org>

< Information Arts: Stephen Wilson Book-Release Party >

In early December, LEONARDO will host the release celebration of the highly anticipated book by Stephen Wilson, *Information Arts: Intersections of Art, Science, and Technology*. The event will take place in Mountain View, CA. The book offers the first comprehensive survey of international artists who incorporate concepts and research from mathematics, the physical sciences, biology, kinetics, telecommunications and experimental digital systems such as artificial intelligence and ubiquitous computing. In addition to visual documentation and statements by the artists, Wilson examines relevant art-theoretical writings and explores emerging scientific and technological research likely to be culturally significant in the future. He also provides lists of resources, including organizations, publications, conferences, museums, research centers and Web sites.

For information on Leonardo, visit our web site:
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For information on GroundZero, visit <<http://www.GroundZero.org>>.
For more information, reviews and to pre-order this book, go to
<<http://www.amazon.com>>.

< Leonardo Co-Sponsors Workshop on Aesthetic Computing in July 2002 >

Leonardo/ISAST is co-sponsoring a workshop on aesthetic computing (artist-driven computer science) to be held at Dagstuhl, Germany, from 15-20 July, 2002 and being led by Paul Fishwick of the University of Florida (see his article earlier in this issue). Go to
<<http://www.dagstuhl.de>>. Information on the workshop can be found at:
<<http://www.cise.ufl.edu/~fishwick/cap6836/ac.pdf>>.

Dagstuhl seminars have from 25 to 60 participants, with roughly 20% in attendance being young researchers. Participation at the workshop is by invitation only. Leonardo associate members who may be interested in attending should send e-mail to <leo@mitpress.mit.edu> with the URL of your CV. There is a waiting list for participants; attendance will be on a space available basis.

A permanent mailing list on the topic can be accessed at
<<http://www.yahogroups.com>>, under the group "aestheticcomputing" (no spaces). Please feel free to subscribe, should this suit your interests.

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ANNOUNCEMENTS

< Harold Cohen's AARON Now Available as Shareware >

As you may know, we have an innovative program available called AARON, which is a cybernetic art Program. We are pleased to let you know that AARON is now shareware and no longer times out. You are welcome to download the free non-time-out shareware version of AARON (at <<http://www.KurzweilCyberArt.com/ac>>). If you have already downloaded it, un-install your current version first.

If you decide to keep the AARON software, we ask you to register it. However, the product will not time out, and the payment requirement is based on trust.

AARON is not your ordinary screensaver. Developed by Harold Cohen over a period of nearly 30 years, and productized by Kurzweil CyberArt Technologies, Inc., AARON is the first fine-art screensaver to utilize artificial intelligence to continuously create original paintings on your PC.

To provide more background on this innovative software, here is my original letter announcing AARON:

I have been deeply involved in Artificial Intelligence research for nearly 40 years, and for most of that time I've watched Harold Cohen create the most sophisticated 'cybernetic' art program that I am aware of. Harold's AI-based program, which is called "AARON," actually creates original paintings on your computer's screen, each one completely different. If a human created paintings like AARON, we would regard him or her as an acclaimed artist. Indeed hard copies of AARON paintings have hung in museums around the world (London's Tate Modern Galley, Amsterdam's Stedelijk Museum, San Francisco Museum of Modern Art, Brooklyn Museum, and Washington Capital Children's Museum, to name a few).

I have had a copy of AARON running on a large panel display in my lobby for the last two years, and it never fails to elicit enormous interest. It's often hard to get people to leave the lobby to start our meetings. So I have exclusively licensed Harold's remarkable art software, and my software team has created a polished product. You can download a free trial copy at <<http://www.KurzweilCyberArt.com/ac>>, or view an AARON painting (rendered stroke by stroke) that I just created at <<http://www.kurzweilcyberart.com/ac/sample>>.

Once downloaded, your screen saver will create an endless sequence of original art. Every unique painting that appears on your screen will be different from those that appear on the many copies of AARON running on computers around the world. It's a lot more interesting than screen savers that always look the same. You actually see each line being drawn and each color being applied stroke by stroke. Already an artist with an international reputation when he started working on AARON in the early 1970s, Harold has spent nearly 30 years teaching the AARON software how to draw, his theory of color and the secrets of composition. It is an outstanding example of artificial intelligence in action.

You can save and print out the artworks, and even send them as creative

greetings to your friends. When your friends receive them, they are rendered stroke by stroke just as they were originally created.

If you like the program as I do, then use the "send to a friend" feature to let them know about it as well. After all, I liked it so much that I bought the exclusive license.

Enjoy your original AARON paintings,

Ray Kurzweil
<<http://www.KurzweilCyberArt.com/ac>>
E-mail: <art@kurzweilcyberart.com>

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LEA
PUBLISHING &
SUBSCRIPTION
INFORMATION

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425 Market St., Second Floor
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E-mail: <leo@mitpress.mit.edu>

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Leonardo Electronic Almanac is published by:

The MIT Press Journals
Five Cambridge Center
Cambridge, MA 02142 U.S.A.

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