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CONTENTS
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EDITORIAL

-----  
< Language, Art and Science in Interstellar Communication, by  
Douglas A. Vakoch >

FEATURES

-----  
< Abstracts from the 2003 SETI Workshop >  
< Something Has Doubled: The 15th Anniversary of the  
Discovery of DNA, by István Hargittai >

LEONARDO DIGITAL REVIEWS

-----  
< Technoetic Arts, reviewed by Ms. Soh Yeong Roh >  
< Czech Photographic Avant-Garde: 1918-1948, reviewed by Claire  
Barliant >  
< Art lyrique et art numérique, reviewed by Stefaan Van Ryssen >

ANNOUNCEMENTS

-----  
< LEA Call for Papers: Artists and Scientists in Times of War >  
< Call for Participation and Announcement - Digital Arts  
Histories >  
< Aesthetic Computing Manifesto >

ISAST NEWS

-----  
< LEA educators initiative >  
< OLATS News >  
< Leonardo Award for Lifetime Achievement - Call for  
Nominations >  
< Leonardo Music Journal Vol. 12 (\*Pleasure\*) now available >  
< Call for Papers: LMJ Vol. 14 (2004) >

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EDITORIAL
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< Language, Art and Science in Interstellar Communication >  
by Douglas A. Vakoch

If some day we humans decide to transmit intentional messages to the stars, what should we say, and how should we say it? Since the beginning of the scientific Search for Extraterrestrial Intelligence (SETI) over 40 years ago, astronomers, physicists and engineers have mulled over these questions. Seldom, however, have artists or scholars from the humanities seriously considered the challenges of interstellar communication. On 23 and 24 March, 2003, a score of specialists from a range of disciplines gathered in Paris to change that.

This meeting, "Encoding Altruism: The Art and Science of Interstellar Message Composition," was sponsored by the Leonardo Network/OLATS, the SETI Institute, the John Templeton Foundation and the International Academy of Astronautics. The charge of the participants was to identify fruitful ways that we could convey some of humankind's varied notions of altruism in interstellar messages. Though SETI groups throughout the world agree that it is premature to transmit prior to broad-based international discussion, if some day a signal is detected from another civilization, surely there would be suggestions from some quarters to reply. The workshop was intended to promote that discussion well before there is a pressing call to begin transmitting.

Abstracts of selected papers presented at the 2003 workshop follow, along with an overview of the science behind SETI that was presented at the 2002 incarnation of the workshop by astronomer Dan Werthimer and biologist Mary Kate Morris. All quotes in these prefatory remarks are taken from the abstracts that follow. A more detailed discussion of many of these issues can be found in the collection of original essays, \*Between Worlds: The Art and Science of Interstellar Message Composition,\* to be published in the Leonardo Book Series by the MIT Press in Spring 2004.

As the following abstracts show, many of the workshop participants reflected on the origins and nature of language as they searched for ways to craft meaningful messages to extraterrestrials. Other themes of the workshop, not highlighted in this selection of abstracts, included the value of creating messages that are interactive and the challenges of encoding the many meanings of altruism.

According to computer scientist Colin Johnson, we are going to have a difficult time finding a universal language for interstellar communication when we do not understand well how even a single language evolved here on Earth. And, as his fellow workshop speaker, archeologist John B. Campbell shows, the problem is not only one of determining the \*mechanism\* of language evolution, but also the \*timing.\* As Campbell summarizes, "Precisely when symbolic communication began in the human evolutionary family is a matter for debate."

The problem with clarifying the origins of language, Johnson emphasizes, is that we have not been able to compare the origin and early evolution of many different examples of language here on Earth. The solution he offers is to draw on the discipline of artificial life, allowing us to simulate the origin and initial development of language many times over. By looking for common patterns in the thousands of examples, we might get a glimpse into possible universals that could help us communicate with independently evolved beings on other worlds.

A similar approach is advocated by Mauro Annunziato, an engineer who creates art using digital life, and in the process learns about the evolution of language. Part of the value of studying the emergence of autonomous languages in digital beings, according to Annunziato, is that the characteristics of digital life may bear similarities to extraterrestrial life, at least insofar as digital life requires us to be open to new possibilities for defining exactly what life is: "Digital beings are different from any well-developed terrestrial organic beings. They belong to another world, in which some intellectual abilities developed long before certain sensory capabilities. Nothing is given, and everything must be created through evolution." For Annunziato, biological notions of survival of the fittest, which portray nature red in tooth and claw, might be replaced by a metaphor emphasizing the importance of language in the evolutionary process: "survival of the clearest."

Comparative psychologist and philosopher Dominique Lestel raises the question of whether language should be our central starting point in creating interstellar messages: "Up to now, it has always been through language that humans have evaluated the effectiveness of language. One of the main interests of SETI is precisely to think more deeply about these issues." Instead, Lestel suggests that we might focus on the intentionality of the communication: "How could we figure out a message whose main content (but is it really a content?) is to proclaim that it is a message from intelligent beings? This is a true challenge for artists...." In Lestel's view, artists might contribute to interstellar message design by creating messages that draw upon scientific insights, as illustrated by two "artistic performances for interstellar communication" that he suggests: "the first one will be to design self-referential temporally fractal messages, and the second will be the design of messages based on non-Darwinian biological mutations."

Rather than focusing exclusively on language, we might instead examine the basic components of all forms of communication, an approach advocated by anthropologist Vladimir Ivkovic, who notes that "All communication involves the same basic interactive elements: sender, information, signal, channel, noise, receiver. The interplay of these elements is described by cybernetics...." This approach has the virtue of helping understand the behavioral and social context in which language, as well as other forms of communication, is used.

Historically, discussions of appropriate "languages" for interstellar communication have concentrated on the use of knowledge bases that are presumably shared by humans and extraterrestrials. Philosopher and physicist Sundar Sarukkai identifies the most frequently assumed knowledge base: "Nature, for scientists, is universal in the sense that the laws of science hold in any region of the universe. Their belief that nature is written in the language of mathematics actually reflects their belief that mathematics is a universal language." But even supposing that all extraterrestrials capable of interstellar communication have something like mathematics and the physical sciences, would they express their understandings in a language comparable to our own? As Sarukkai observes, "mathematics as a language ... is indebted to the world in which we live." Would extraterrestrial intelligence, living on worlds that differ from ours physically, biologically and culturally, even share a common language of mathematics with humans?

We might, of course, not rely on languages per se for interstellar communication. Most proposals for interstellar messages over the past 40 years have, indeed, not focused on specifically linguistic messages and many alternatives were suggested at the recent workshop, including messages based on images, music, logic and computer algorithms. But regardless of the \*form\* that a message might take, what should be its \*content?\*

Suppose we could succeed in communicating notions of altruism, the central subject matter of the workshop. Wouldn't such a portrayal border on deception? As novelist Diana Slattery cautions, "Convincing an ETI, truly an 'outsider' of our altruistic potential as a species, might be a hard sell if they've had access to our history books, news services, or entertainment channels." Indeed, in the recording attached to two Voyager spacecraft, the 100-plus pictures of Earth lacked any images of poverty, pestilence or war.

"If some day signals are sent to follow Voyager," Slattery suggests, "the trust displayed in this effort - that we are communicating at all - may be the surest sign of our own potential for altruism. Whatever we decide to communicate," she adds, "we are saying in the act 'Here we are; please get in touch.'" But are images of altruism really representative of our day-to-day actions? Slattery suggests that it may be appropriate to start a conversation that could last for generations by putting our best foot forward.

Though for now SETI focuses its energies on listening for signs of intelligence in the universe and not on transmitting, Slattery's recommendation for how we might some day portray ourselves in interstellar messages is worth pondering now. "That we are concerned about how we are perceived," she observes, "that we are considering how to foreground one of our best aspects - the altruistic - seems a prudent way to whisper into the void."

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FEATURES
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< Abstracts from the 2003 SETI Workshop >

This month in LEA, we present the first of two special issues highlighting material from the 2003 SETI (Search for Extra-Terrestrial Intelligence) workshop in Paris. Following are selected abstracts from the conference, exploring a wide range of themes. We will present further material from the workshop in an upcoming issue.

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< Are We Alone?: The Search for Extraterrestrial Civilizations >

Dan Werthimer, Space Science Laboratory, University of California, Berkeley, CA, USA

Mary Kate Morris, Department of Public Health, San Francisco, CA, USA

For thousands of years, Earthlings have been asking the question, "Are we alone?" Our civilization may now have the tools to answer this question.

Present radio and laser technologies are capable of transmitting and receiving messages across our Milky Way galaxy. Our civilization has been unintentionally transmitting television, radio and radar signals out into space for the past 50 years. Early television broadcasts, such as \*I Love Lucy,\* have already reached thousands of stars and they continue to propagate out at the speed of light. Earthlings have also sent a few intentional radio transmissions, such as the Arecibo message, beamed to a star cluster in 1974, which contained information on our biochemical make-up and our location in the solar system.

Nearby extraterrestrial civilizations could detect our radio, radar and television leakage using large radio telescopes. Advanced civilizations might also detect life on Earth by using large optical telescopes and spectrometers to analyze the chemical constituents of Earth's atmosphere; oxygen, ozone and methane betray the presence of life.

Like our civilization, extraterrestrial civilizations might transmit unintentional radio, radar, or navigational beacons out into space. Or they might deliberately transmit radio or optical messages for the purpose of interstellar communication, either beamed toward us, toward other civilizations, or transmitted omnidirectionally. Intentional communication could contain substantial information about their culture. Such messages could be sent anticryptographically, with language lessons, pictures and mathematics; messages might contain a civilization's literature, music, art, history, science, medicine and information about other civilizations they may have been in contact with. Our solar system is middle-aged, about five billion years old; some stars are twice our age and may harbor very advanced civilizations.

Using this rationale, several research groups are conducting searches for radio and optical signals from extraterrestrial civilizations. For a summary of current SETI programs, see Tarter (2001) and MacRobert (2002).

It is not possible to do a comprehensive SETI search with current technology, so there are several different search strategies. For example, The SETI Institute's Project Phoenix is conducting a targeted radio search of 1000 nearby solar-type stars; this search has good frequency coverage and is very sensitive, but targeted searches can only cover a small fraction of the sky. SETI sky surveys have good sky coverage, observing billions of stars and galaxies, but they have relatively poor frequency coverage and sensitivity. Radio SETI sky surveys are ongoing at Argentina (Project META), Australia (Southern Serendip), Harvard (Project BETA) and the University of California (SERENDIP and SETI@home). Optical searches for pulsed or continuous laser signals are ongoing at observatories at Harvard, Princeton, Australia, Ohio and the University of California.

Although our civilization cannot presently conduct a

comprehensive search for extraterrestrial electromagnetic communication, SETI capabilities are doubling every year as telescopes and signal-processing capabilities improve. If there are radio or optical signals out there, Earthlings will soon discover ET.

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< Altruism, the Evolution of Language and Interstellar Communication >

Colin Johnson, Computing Laboratory,  
University of Kent, Canterbury, UK

One problem with developing interstellar communication is that we have little sense for the high-level "universals" of linguistic communication (or, indeed, whether such universals exist). The main reason is that, whilst there are many languages in the world, these languages have developed from a small number of early proto-languages (perhaps just from a single original "origin of language").

Many fields advance by looking at many independent examples and teasing out universal or commonly found features, distinguishing those features from accidental features found in a particular example. The study of language does not have that opportunity; it is difficult to know whether a particular universal or nearly universal feature of language has arisen because it represents a powerful way of representing some aspect of the world or whether it arose just because it was a feature of a proto-language.

A similar problem exists in the study of life, in particular the origin of life. In the approach taken here, known as "artificial life," caricatures of that early development are implemented on computers, so that this origin can be "replayed" many thousands of times with slightly different variations of environment and different random historical contingencies. This then gives a set of different "origins of life" which can be studied using the comparative method. The origin of language (or of specific language features) can be studied in this fashion using simulations of early language development and game-theoretic motivations for the development of cooperation in early language.

In this talk, I would like to discuss the following putative approach to interstellar communication. First, computers could be used to produce many examples/caricatures of proto-languages by simulating linguistic interactions between simulated agents; then we may be able to discover some (high-level) patterns that are common to many proto-languages. In particular, we may be able to discover patterns concerned with how language encodes for cooperation and mutual understanding, even in a situation where each linguistic agent is aiming to selfishly maximize its personal success.

A motto for work in artificial life is "life-as-it-could-be," as contrasted with "life-as-it-is." The aim here is similar. Can we use "artificial languages," evolved on the computer via interactions between linguistic agents, to provide a set of comparative languages that could be used to extract meta-features, which in turn could be used in the encoding of interstellar messages? In particular, are there quasi-universal patterns by which altruism, communal understanding and cooperation are encoded in languages? What might "language-as-it-could-be" look like?

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< Archaeology of Symbolic Communication: Antiquity and Evidence for Altruism >

John B. Campbell, School of Anthropology, Archaeology and Sociology, James Cook University, Cairns, Queensland, Australia

Precisely when symbolic communication began in the human evolutionary family is a matter for debate in archaeology and its allied disciplines in the quaternary and social sciences. The conservative view is that the earliest evidence belongs only to "anatomically modern humans" (AMH, "Homo sapiens sapiens," the subspecies which includes all living people as well as recent fossil forms) and falls within the last 50,000 to 30,000 years. This evidence is seen as including Upper Paleolithic cave art in the Franco-Cantabrian region of southwestern Europe; other forms of Upper Paleolithic art, artifacts and settlement patterns across various parts of Europe and Asia; Quaternary Ice Age Australian Aboriginal rock art; and the indirect but nevertheless firm evidence for voyaging beyond the sight of land for the first human colonization of Australia and northern Melanesia from Southeast Asia. The latter included navigation across open stretches of water some 100 to 200 km wide and successful return voyages, judging from the redistribution of raw materials and animals that people carried with them.

The liberal view is that some abstract rock art was being produced earlier in Europe by Neanderthal people ("Homo sapiens neanderthalensis" or "Homo neanderthalensis," depending on one's taxonomic scheme), as well as even earlier in India by late "Homo erectus." Though probably mostly within sight of land, very early voyaging is seen as having begun more than 1 million years ago in the Mediterranean basin (particularly between Africa and the Iberian Peninsula) and in island Southeast Asia (particularly the island of Flores, which was reached by 700,000 years ago and which never had a land-bridge connecting it with the Quaternary Ice Age extensions of mainland Southeast Asia). The former (Strait of Gibraltar) was carried out by "Homo ergaster" and the latter by "Homo erectus" (Flores). And although associated with AMH, Upper Paleolithic-style artifacts began in central and southern Africa more than twice as early as in Europe or Asia.

Once symbolic communication was fully underway and sedentism (i.e., settling down in one place, vs. nomadism) had increasingly become the trend in various parts of the world where farming (i.e., domestication of plants and animals) had begun to produce food surpluses, then within the last 6,000 years various writing systems were developed to record information and beliefs. As they were created and refined mostly independently of each other (in Egypt, Mesopotamia, China, Mexico, etc.), the logic and style of the earliest writing varies quite a lot. By the time writing

began, the world's languages were linguistically advanced, and the various known language families had been born. Combinations of these and other factors have made deciphering some early writing very difficult at best. Even those written forms that have some continuity with the present, like certain Chinese characters, are not without their difficulties. The equivalent of the Rosetta stone, which helped so much with Egyptian, is not always found either, and even when it was in effect being created, it was sometimes destroyed (Aztec and Maya) for religious reasons. There are often problems with translation and consequently there may be more misinterpretations than are often admitted in studies of early writing. Alternatives to writing are also worth considering (e.g., the Peruvian "quipu").

Evidence for altruism is even harder to come by than that for symbolic communication. Compassion and long-term care of disabled individuals amongst Neanderthal people could be seen as indicating altruism. But it is through the interpretation of written records and oral histories in much more recent times that one can obtain some insights into possibly altruistic behaviors. Cross-specific or inter-species examples of possible altruism are also worth considering (e.g., amongst primates, carnivores, cetaceans), as are the implications of key parts of the relevant evidence overall for problems and challenges in interstellar messaging.

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< Hybrid Ecosystems: Searching for a Language >

Mauro Annunziato, Plancton Art Studio, Rome, Italy

The life around us can assume various forms, with its common invariants not being in physical shape and form, but rather in evolutionary principles and processes: self-organization, genetic evolution and individual and social learning. With this inspiration, the art-group Plancton has delineated a path of expressive search for a new form of life: digital life. In spite of the provocative and futuristic topic, visitors of the Plancton installations feel above self-identification with the basic processes of our individual and social existence, followed by the fascination of finding oneself in front of an alien life form, seeking a relationship with it, and better understanding the huge and fragile patrimony accumulated along any course of evolution.

In the present contribution, we offer two audio-visual interactive installations that may inform discussions of interstellar communication: \*Relazioni Emergenti\* and \*E-Sparks.\* \*Relazioni Emergenti\* (Emerging Relationships) is an artificial-life environment where living filaments, endowed with their own character and autonomy, grow, reproduce and evolve through genetic mutations. The global result is a strong visualization of the concept of self-organization: structured complexity and organic shapes emerge as the result of the evolutionary composition of the local chaotic interactions.

\*E-Sparks\* is a representation-metaphor of a hybrid ecosystem created by humans and digital beings capable of developing an autonomous primitive language. Individuals in this ecosystem are able to learn words from visitors and merge them into their own memory. Through social interaction, the words are transformed, associated with meaning and included in the society's common vocabulary. A sort of survival of the clearest mechanism emerges in the course of this evolution.



The paradigms involved in the search for communication between humans and artificial beings could be revised to provide some ideas for interstellar communication. In the creation of societies of evolving digital creatures many new problems arise, like the development of an autonomous language or the emergence of a sort of digital consciousness. Digital beings are different from any well-developed terrestrial organic beings. They belong to another world, in which some intellectual abilities developed long before certain sensory capabilities. Nothing is given, and everything must be created through evolution. Ethics does not exist - only necessity and strategies of survival do. In this sense, altruism, affect and cooperation must contribute to social organization to survive. Finally, small differences in the genetics and behavior of a single individual can yield huge differences in social organization, and social organization can mould the behaviors of an individual, as seen in ant colonies. Thus, we might find very efficient organizations based on individuals very different from humans in intelligence and biodiversity. Although the art-science experiments mentioned above cannot find final solutions, they can help focus open questions.

Perhaps the prerequisite to interstellar communication most difficult to communicate is the motivation to exist and to be curious. Assuming this motivation is shared with extraterrestrials, it might provide the foundation for communicating other information. Art images and sequences inspired by the process of life could well express our fascination, love and interest for life to interstellar friends.

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< Animal Communications and SETI : Are Humans Universal Locutors? >

Dominique Lestel, Departement d'Etudes Cognitives, Ecole normale superieure, Paris, France

In the 1950s, French linguist Emile Benveniste could not accept the idea that bees have "true" symbolic language, because they can only communicate about food location. On the contrary, he said, all human languages have the unique ability to talk about everything. Such a statement points to one basic postulate that every ethologist is ready to take for granted today: human language is not only able to talk about everything, it also has the capacity to decipher all codes and to understand all possible means of communication. A related idea has been expressed by Noam Chomsky, when he explains that a human being is able to learn every foreign language through practice and that one could understand extraterrestrial communications through experiments similar to scientific ones. Such a belief gives human beings a status as universal interlocutors. Through language (but not necessarily only through language), humans are able to communicate with everything that or everybody who communicates. Is this true?

First, one must make sure that this is not self-deception. In other words: what are really the limits of human language? One of the main problems to answering these questions is precisely the property of language that makes humans so proud about it: self-reflexivity, which leads too easily to self-evaluation. Up to now, it has always been through language that humans have evaluated the effectiveness of language. One of the main interests of SETI is precisely to think more deeply about these

issues.

Let's suppose ethologists are right in claiming that human language may decipher each animal message with ad hoc prostheses like computers. Does that mean that we would be able to find and to understand extraterrestrial messages, allowing us to communicate with them? Nothing could be less sure. Communication with potential extraterrestrials differs from animal communications in at least two respects. First, on Earth, as it has convincingly been shown by biologists, we are all cousins; all terrestrial animals share a number of genes. Communication with animals on Earth is always communication with agents sharing a common natural history, and often (as with some pets) a common cultural history. But what does it mean to communicate with intelligent agents with no common natural history? Second, how could we figure out a message whose main content (but is it really a content?) is to proclaim that it is a message from intelligent beings? This is a true challenge for artists, especially if we allow for messages of variable and unknown lengths. The artistic challenge is to know how to design such a message and to try to figure out the ways extrasolar civilizations may send such messages. I shall propose two potential artistic performances for interstellar communication: the first one will be to design self-referential temporally fractal messages, and the second will be the design of messages based on non-Darwinian biological mutations.

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< Cybernetic Models and Interstellar Message Composition:  
Sociobiology of Altruism Revisited >

Vladimir Ivkovic, Zagreb, Croatia

Conveying anthropocentric concepts to extraterrestrial intelligence (ETI) presents a technological, philosophical and ideational challenge. The evolutionary significance of communication between organisms is probably matched only by the importance of the inherent principle of genetic variation responsible for the variety of life on our and possibly other planets. All communication involves the same basic interactive elements: sender, information, signal, channel, noise, receiver. The interplay of these elements is described by cybernetics, a branch of mathematics dealing with problems of control, recursiveness and information.

Cybernetic models help clarify the complexity of human behavior and social interactions. For example, altruistic behavior in various environments, populations and social conditions can be specified through clearly defined variables (e.g., kinship coefficient or wealth) that are constrained by logical rules (e.g., operational definitions of altruistic behavior or inclusive fitness). Altruistic behavior may be simulated over the course of many generations of a population, providing insights into the advantages it yields to individuals and the population as a whole. Cybernetic models help describe the value of altruism in terms of its advantageous impact on individual and inclusive fitness. Cybernetic models yield quantitative data that can be translated into simple mathematical logic and encoded for transmission to ETI.

These models can be encoded in interstellar messages through observable human behaviors using the Motion Energy Detection (MED) algorithm. The MED algorithm detects and measures the

speed, vector orientation and energy of movement from filmed behavior. This method has the advantage of requiring no assumptions about the structure and organization of specific behaviors being analyzed. The MED algorithm analyzes the number of movements, as well as their duration, size, speed, complexity and information content from videotaped episodes of body movements and voice. It has been used to identify motivations, intentions, personality traits, deception, indoctrination and gender. Since it is applied to filmed behavior, it allows for direct depictions of various episodes and scenarios of altruistic as well as non-altruistic behavior, ultimately including animated depictions of human behavior, gait characteristics and general anatomy. One of the greatest advantages of this approach for interstellar message construction is that it produces raw data that can be quantified, digitized and electronically manipulated to match the desired mode of transmission.

The MED algorithm is available in the E-motion software platform developed under the leadership of Prof. Karl Grammer as a joint venture between the Ludwig Boltzmann Institute for Urban Ethology (Vienna, Austria) and the University of Kyoto (Kyoto, Japan).

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< Universality, Emotion and Communication in Mathematics >

Sundar Sarukkai, National Institute of Advanced Studies, Indian Institute of Science Campus, Bangalore, India

For the sciences, the model of universality is the language of mathematics. Eminent scientists from Galileo to Feynman have understood the activity of science as reading the book of nature, with this book being written in the language of mathematics. Nature, for scientists, is universal in the sense that the laws of science hold in any region of the universe. Their belief that nature is written in the language of mathematics actually reflects their belief that mathematics is a universal language. A simple consequence is that even extraterrestrials would understand the world around them in terms of this universal mathematical structure.

This is indeed a momentous conclusion that scientists make about the universe, and there are many problems with it. The first challenge to the universality of mathematics can be mounted when we understand mathematics as a language that is indebted to the world in which we live. Moreover, mathematics exhibits discursive strategies such as rhetoric, and it uses metaphors in ways similar to other languages like English. Mathematics has unique writing strategies that are essentially driven by human subjectivity (Sarukkai, 2002). The use of mathematics in disciplines such as physics clearly exhibits anthropocentric concerns (Steiner, 1998). In such a scenario, can we expect mathematics (and more generally the sciences, which are based on mathematics) to play the paradigmatic role in interstellar communication?

There are also some other fundamental issues that arise when we look at the communicative role of mathematics. For example, emotion seems to be a fundamental characteristic of conscious beings. Natural languages like English encode emotion in various ways. The uniqueness of mathematics, and in fact its objectivity, lies in its claim to have removed the emotional content that is present in natural languages and literary discourses. If this is so, how then can mathematics encode altruism, which is

essentially related to emotions?

But we also recognize the uniqueness of mathematics - perhaps in its capacity to order nature. If we acknowledge that mathematics is essentially human in that it also encodes emotions and evocativeness in its discourse, then we can learn to fashion mathematics to encode altruism for extraterrestrial communication. The presence of rhetoric and metaphors in mathematics and physics, and the important role that aesthetics plays in the scientific imagination, suggests that it is indeed possible to do this.

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< The Glide Model: Communicating Intention through Gestural  
Language >

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When human strangers meet for the first time, face to face, non-verbal aspects of communication, the gestures, postures, facial expressions and tensions - collectively, body language - are relied on for crucial assessments of emotional state, trust, truthfulness, relative friendliness or aggression, matters vital to the nature of any further communication with the "unknown." Reading the "other" adds up to, at first pass, divining their intentions and motivations, perceptions that occur perhaps more quickly than the parsing of the rational or denotative content of their communication. Trust in our own ability to perceive another's intentions is especially critical when the parties do not share a common symbolic system. How can we communicate to an ETI that our intentions are benign, that altruism, among humans, is not a field of dreams? Convincing an ETI, truly an "outsider" of our altruistic potential as a species, might be a hard sell if they have had access to our history books, news services, or entertainment channels. How might the non-verbal, the non-symbolic and the multi-dimensional qualities of language assist our ability to encode altruism in our communications between worlds?

Gestural languages (mudras, dance and signed languages) can carry meaning that is both highly sensuous and abstract at the same time. Visual language can speak in complex metaphors while simultaneously carrying a representational message. The Glide sign system models a dynamic (moving, gesturing, transforming) set of signs that can embody both emotional content and a metaphorical syntax (being a web of signs, not a line of words) that expresses connectedness, accommodation, cooperation and mutual movement through its linking, nesting and pattern-forming behaviors and structures. In its fundamental shapes (curved and wavelike) and motions (smooth and flowing), it embodies a

gestural character that can express emotive qualities such as gentleness, non-aggression and beauty (at least to human eyes). If the ETI assesses the "look and feel" of a linguistic event, even before the denotative meaning can be decoded, as we do, then perhaps a positively oriented intention - even an altruistic leaning - can be communicated directly through such gestures. Whether the ETI reads body or embodied language as we do (and the human vocabularies of gesture are by no means universal) is of course not known. Therefore the aspects that express, through visual metaphor (or sonic harmonies) concepts of interconnection and cooperation may operate at a more fundamental level.

The wavelike visual structure of the Glide glyphs suggests a relatively simple transmission scheme. The chosen carrier signal (whether radio or light) can be modulated by the sinusoidal frequencies of the glyphs at whatever bandwidth the transmission is made. Received signals could be mapped to a choice of sensory modalities: sound, sight, or even direct physical vibration. Such a mapping, emanating from fundamental waveforms, does not, of course, have to be limited to human sensory ranges.

If someday signals are sent to follow Voyager, the trust displayed in this effort - that we are communicating at all - may be the surest sign of our own potential for altruism. Whatever we decide to communicate, we are saying in the act "Here we are; please get in touch." That we are concerned about how we are perceived, that we are considering how to foreground one of our best aspects - the altruistic - seems a prudent way to whisper into the void.

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< Something Has Doubled: The 15th Anniversary of the Discovery of DNA >

by Istvan Hargittai, Budapest University of Technology and Economics, H-1521 Budapest, POB 91, Hargittai@tki.aak.bme.hu

The double helix, discovered 50 years ago, has replaced the mushroom cloud of the atomic bomb as a symbol of modern science. On 25 April, 1953, a one-page article appeared in *Nature* (London), entitled "Molecular Structure of Nucleic Acids: A Structure of Deoxyribonucleic Acid" [1]. In it, James Watson (b. 1928) and Francis Crick (b. 1916) suggested a double-helix structure for the substance of heredity, known also as DNA. A purely diagrammatic figure of elegant simplicity illustrated the note. It showed the two helices of the molecule that were related by a two-fold axis of rotation perpendicular to the common axis of the helices. This symmetry implied that the two helices ran in opposite directions, complementing each other. The paper described the two helices as held together by purine and pyrimidine bases, joined in pairs, as a single base from one being hydrogen-bonded to a single base from the other. A by-now famous sentence concluded the note - "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material." A new era of science was begun.

Much of the achievements of molecular biology today, including the Human Genome Project, can be traced back to the discovery of the double helix. The double helix, deservedly, catapulted Watson and Crick to fame, but there were other players who should also be remembered. Oswald Avery (1877-1955) and his two associates showed in 1944 that DNA was the substance of heredity. Sven

Furberg (1920-1983) uncovered important features of the DNA structure in 1949, such as the bases and the sugar rings being perpendicular to each other. Erwin Chargaff (1905-2002) determined that while the relative proportions of the various bases differed considerably in the DNAs of different organisms, the relative amounts of different bases followed strict regularities. There was a one-to-one correspondence between certain bases. Rosalind Franklin (1920-1958) produced X-ray diffraction photographs of DNA that proved its helical structure.

While these were crucial contributions the likes of which would have brought out the DNA structure in time, Watson and Crick's discovery was a master stroke. They received the Nobel Prize in Physiology or Medicine in 1962, sharing it with Maurice Wilkins (b. 1916), who did a comprehensive X-ray crystallographic study of the DNA structure. In addition to the enormity of the importance of the DNA structure, various aspects of its discovery have been immortalized in literary creations, the most notable of them being Watson's *\*The Double Helix,\** first published in 1968 and having remained a best-seller ever since. The double helix has become a subject of artistic creation, especially related to sculpture. Erwin Chargaff did not mean it kindly when he noted its popularity, but his sarcasm notwithstanding, he was not far off the mark when he said "...the outstanding charismatic symbol of our time - the spiral staircase leading, I hope, into heaven -

has been advertised with a truly remarkable intensity" [2]. It has been used as an emblem, it has been put on neckties, it embellishes letterheads, it stands outside of buildings as what might be called commercial sculpture. It has even invaded the higher forms of mannerist art.

There is something breathtaking in the double helix structure, whether it is represented by a diagrammatic sketch or an elaborate design. On the campus of Cold Spring Harbor Laboratory, a recently unveiled sculpture has conspicuous simplicity; the two helices are connected with straight rods and at the top the dividing two helices are turned back into the ground that may have symbolic importance but serves also as a stabilizing feature. Possibly the most spectacular and largest sculpture stands outside the Biomedical Center of Uppsala University, ascending vertically as if from a cell and splitting at the top as if getting ready for reproduction. This is an ornate creation in which various elements of the DNA structure may be recognized, but closer scrutiny reveals an error in the arrangement. The bases appear to be outside of the backbone rather than, as they should, on the inside [3].

It appears that the discovery of the double helix uncovered one of life's most fundamental secrets. It has contributed to improving the quality of life and, in this, its potentials appear to be boundless, although genetic engineering has a long way to go to reach general acceptance appropriate guidelines of its use. It has also created a bridge between science and the arts.

In memoriam - Erwin Chargaff (1905-2002)

#### REFERENCES

1. J. D. Watson, F. H. C. Crick, "Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid," *\*Nature,\** Vol. 171 (1953) pp. 737-738.

2. E. Chargaff, *\*Heraclitean Fire: Sketches from a Life before*

Nature,\* The Rockefeller University Press, New York, 1978, p. 106.

3. Linus Pauling had published a structure before the Watson-Crick discovery that had this erroneous feature, so it may have been his influence on the sculptor or it may just have been an expression of artistic freedom.

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LEONARDO DIGITAL REVIEWS 2003.04
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April 2003

This month, our web coordinator Robert Pepperell has made some changes to the layout of the Leonardo Digital Reviews web page. In keeping with the way that on-line scholarly publishing is going, we all felt that it was time that attention was paid to the presentation of what is self-evidently high-quality material. Other changes that you may notice in the body of the reviews at the website is that they are formatted in ways that they are not in the e-mail version of LEA. This development is in order to support some sterling work from the panel and editorial team.

Following the list of new reviews, LDR features three of the 13 new reviews posted this month. We are particularly grateful to Ms. Soh Yeong Roh, Director of the Art Center Nabi, Korea for the work she has done in reviewing Roy Ascott's *\*Technoetic Arts,\** which is at the moment only available in Korean (having been translated from Japanese). The insight that this gives to those of us unable to read the original and the extension of our intellectual network is more than welcome. Also featured as a voice from the Eastern Seaboard of the USA is Claire Barliant's review of *\*Czech Photographic Art 1918-1948.\** Finally, one of our more prolific European panelists at the moment, Stefaan van Rysen, has reviewed *\*Art lyrique et art numerique, A propos d'une scenographie virtuelle interactive de Norma de Bellini.\** Again we are grateful to him for drawing attention to an esoteric topic that may have slid by many of us.

These reviews (now fully formatted!) together with all the new reviews are available at:  
<http://mitpress.mit.edu/e-journals/Leonardo/ldr.html>.

Michael Punt  
Editor-in-Chief  
Leonardo Digital Reviews

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In this month's Leonardo Digital Reviews:

Art lyrique et art numerique, A propos d'une scenographie virtuelle interactive de Norma de Bellini. Actes de la jounee d'etudes du 17 aoÛt 2001, edited by Alain Bonardi  
Reviewed by Stefaan Van Rysen

Coney Island: The People's Playground, by Michael Immerso  
Reviewed by Michael Punt

Czech Photographic Avant-Garde: 1918-1948, by Vladim' r Birgus  
Reviewed by Claire Barliant

Dust Theories, by Kim Cascone  
Reviewed by Robert Pepperell

Fantasies of Fetishism: From Decadence to the Post-Human,  
by Amanda Fernbach  
Reviewed by Robert Pepperell

Guy Debord and the Situationist International: Texts and  
Documents, edited by Tom McDonough  
Reviewed by Sean Cubitt

The New Wave By Itself, dir. Robert Valey and Andre S. Labath  
Reviewed by Michael Punt

Problemarket, Problem Stock Exchange, Annual Report 2001-2002, by  
Davide Grassi and Igor Stromajer  
Reviewed by Stefaan Van Ryssen

The Soundscape of Modernity, Architectural Acoustics and the  
Culture of Listening in America 1900-1933, by Emily Thompson  
Reviewed by Stefaan Van Ryssen

Time Stands Still: Muybridge and the Instantaneous Photography  
Movement (exhibition), guest curator Philip Prodger, and Time  
Stands Still: Muybridge and the Instantaneous Photography  
Movement, by Philip Prodger and Tom Gunning  
Reviewed by Amy Ione

Art and Dynamic Utopia of Interactivity and Connectivity: Roy  
Ascott's "Technoetic Arts," translated by Yi Won Kon  
Reviewed by Jeong Hee Bae

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< Technoetic Arts >

By Roy Ascott, edited and Korean translation by Yi Won-Kon. Media  
and Art Series no. 6, Institute of Media Art,  
Yonsei University Press, Yonsei, 2002. 226 pp., illus.

Reviewed by Ms. Soh Yeong Roh, Director, Art Center Nabi.

\*Ed. note: this is one of two reviews of this book, the first of  
which, by Jeong Hee Bae, is listed above.\*

It is a very happy occasion for the Korean media arts community  
that Roy Ascott's book has been published in Korean. This book is  
a collection of essays from his early writings (1968) to the most  
recent (2000). Ascott's clear vision of media art emerges  
consistently throughout his writings. This is a book of an  
artistic vision, one that is unique and powerful, urging  
contemporary media artists into action.

Ascott's world view resonates with influences from new sciences  
(Ross Ashby, Fritjof Capra and Peter Russell, among others).  
Nobert Wiener's cybernetic theory also seems to have opened his  
eyes to the immense possibilities that computers can offer to  
art. The artist in him was particularly interested in how  
meanings are created through interactions in cybernetic systems.



Beyond the Newtonian determinism, Ascott envisions "worlds" that are created through interactions among people's minds; worlds that are inherently fluid, transitory and emergent; and worlds where there can indeed be creative syntheses of science and art. In networked art, or "telematic art" as he calls it, Ascott saw the possibility of constructing such new worlds as early as the late 1960s, when ordinary people had hardly heard of cybernetics, or even computers.

Ascott makes it plain that the task of twenty-first century art is to construct new realities by bridging the minds and consciousness around the planet. These are the worlds (and realities) where diversity, artistic creativity and democratization of meaning are respected. In these worlds, human exchanges reach the level of consciousness, thereby creating global, collective consciousness. In this Chardin-like utopian vision, global communities can be formed where truth can be pursued, not by manipulating discourses, but through free associations of ideas, interweaving of images and by direct experiences.

With the advances in biosciences from the 1980s onward, Ascott adds another dimension to his creative synthesis of art and sciences - artificial life. His dry silicon cybernetic art thus becomes "moist" experimentation in artificial life. He now envisions "re-materialization" of art, combining telematic art with biotechnology. In his celebrated article, "Museum of the Third Kind," we can see that his vision for new art has expanded and fully integrated into his vision for new art institutions. This new art institution has a strong metaphor in artificial life, as in his description of the new museum as a "garden of hypotheses," where we plant ideas, grow forms and images and harvest meaning.

Art, for Ascott, is an open-ended process that requires active participants, not passive audiences. It is a process that aims at transforming isolated individual consciousness into an elevated state of collective consciousness, as he so eloquently espouses in "Is There Love in Telematic Embrace?" (1990). This collective consciousness, like the spirit of Gaia, might steer us from the paranoia of the industrial age into the "telenoia" of the post-biological age ("Telenoia", 1993). Fundamentally, Ascott's aesthetics presupposes relentless faith in human creativity and good will, not only on the part of the artists but also of the participants.

One might accuse Ascott of having an unrelentingly utopian worldview. However, his unique aesthetics for media art stems from a great breadth of knowledge, spanning ages and cultures, various sciences and arts. This intellectual dynamism, along with his uncanny insight into nature/culture, man/universe and technology/art, is manifest in his writings throughout the book. Ascott is an action-oriented artist and theorist, who is passionate about creating new worlds rather than analyzing or critiquing existing worlds.

This book, translated into Korean, will no doubt influence young Korean media artists who are exploring new aesthetics of media art. The role of the artist, for Ascott, is in designing the context, rather than the content, of the new symbiosis of art and technology. It is indeed a daunting task of designing, rather than prescribing, new human conditions of our times. Ascott makes it clear: media art is not about refined techniques or filling up contents in established channels. Rather, it is about creating

new contexts in which new meanings can occur through free and open-ended interactions, with no clear distinction between the maker and the viewer. He warns against today's technological art that degenerates into mere spectacles, lacking intimacy and delicacy.

Intimacy and delicacy in technological art will be realized when artists focus on human minds and consciousness, rather than on the novelty of technology. As we are now facing ubiquitous computing environment in this century, more creative energy from media artists are required in order to make the technology serve humanity. And by bridging the creative minds around the globe, we can perhaps dream for a better future, where more human energy is spent on constructing rather than destroying "worlds." Indeed, Roy Ascott shows a way.

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< Czech Photographic Avant-Garde: 1918-1948 >  
by Vladim' r Birgus, MIT Press, Cambridge, MA, 2002.  
311 pp., illus. ISBN: 0-262-02516-7.

Reviewed by Claire Barliant, cbarliant@yahoo.com

Despite the insistence of many that art and politics remain separate, there are several moments throughout history where they have been fiercely intertwined. The relationships between dictatorial regimes and avant-garde movements in early twentieth-century Germany, Russia and Eastern Europe are certainly exemplary of an instance in which politics and art wrap around each other like Laocoon wrestling his snake. In a book titled \*Czech Photographic Avant-Garde: 1918-1948,\* one would hope for some perspective on the relations between aesthetics and politics. Instead, the book focuses on the art. The book is organized by formal concerns, neatly (and perhaps wisely) sidestepping the historical morass of the Soviet invasion. Yet the threat of cultural extinction does surface in uneasy bursts throughout the book, albeit in images, not words.

Originally published in German and Czech to accompany the exhibition \*Modern Beauty: Czech Photographic Avant-Garde 1914-48,\* this beautiful book traces the evolution of Czech photography from its jubilantly experimental beginnings to its premature end at the hands of the emerging Communist regime. This period of art-making produced a great deal of incredibly rich and innovative work, and this elegantly compiled history offers a large selection of photographs from which to draw a sense of the creative activity of this time.

A series of essays, including several by historian Vladim' r Birgus, who conceived of the idea for the book and selected the photographs within, chronicles the influences on Czech photographers and the various trends within the avant-garde movement, such as Poetism and New Objectivity. There are texts on socio-critical photography, the influence of advertising and the design of book covers. Included in the back matter are two chronologies, one on Czech art and one on Czech photography, both by Birgus, that mark important events such as the pivotal Film und Foto exhibition in Stuttgart in 1929, the largest international photography show at the time, and one that finally gave photography its due as an artistic medium in its own right.

Though the essays are dry, heavy with historical data and light on analysis, the book is saved from stuffiness by the many

fantastic pictures inside. Photographs by established masters such as Josef Sudek, John Heartfield (who emigrated to Prague in 1933 and whose brilliantly damning photo-montages of Hitler influenced Czech avant-garde art), and Jaromir Funke share space with artists who have apparently been obscured by time, and whose work obviously deserves the attention it receives here.

There are so many compelling photographs in this book that it is difficult to select any for special notice, but during one perusal of its contents, I was particularly captivated by two images by Eugen Wiskovsky. From the biographies of the artists which appear in the back of the book, I was stunned to learn that not only was Wiskovsky a superb photographer, he was also a brilliant polymath who compiled a German-Czech dictionary, translated some of Freud's writings into Czech, and published theoretical articles on photographic composition. It is one of the successes of the book that his work has been rescued within these pages. His two photographs published here twist the natural landscape into uncanny resemblances of wild seas and man-made objects. \*Disaster\* (1939) depicts a field of grass that is so whipped by the wind that it looks like a raging sea; on the horizon, near the top of the frame, the outline of a structure that resembles a battleship rises from the tumultuous depths. \*Flag\* (1944) shows a recently harvested field rippled by the hilly terrain and seemingly waving like a flag on a pole, the "pole" being the crisp white path that neatly borders the area.

Of the many essays, one of the most compelling is Antonin Dufek's "Abstract and Nonfigurative Tendencies," which explores Surrealism's counterpart: works that do not demonstrate an attachment to the object. Dufek explains how these images render solid objects intangible, dropping the barrier between human and non-human reality. "In the world of this unconditionally determined 'freedom,'" Dufek writes, "anything can happen; the world therefore becomes a mystery, usually a sinister one." It is a rare moment of reflection on the political situation and its relation to the creative energy surging in Prague at that time. Overall, the book would have benefited from more writing like this, well-crafted and packed with observation and insight.

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< Art lyrique et art numerique, A propos d' une scenographie virtuelle interactive de Norma de Bellini. Actes de la jounee d' etudes du 17 aoÿt 2001 >

edited by Alain Bonardi, Universite de Paris-Sorbonne, Observatoire Musical Franais, Paris, 2002. 65 pp., illus. Paper.

Reviewed by Stefaan Van Ryssen, stefaan.vanryssen@pandora.be

\*Art lyrique et art numerique\* (Lyric art and computer art) is a collection of essays delivered at an August 2001 colloquium on the occasion of a performance of Bellini's opera, \*Norma,\* at the "l' Ile d' Yeu" citadel off the French coast. The set was designed by Alain Bonardi, who integrated an interactive projection into the backdrop of the stage, allowing the actors/singers to react to the changing images in the background, all the while changing the sequences of images in real time as well. (See <http://www.computeropera.com> - in French only.) The interaction being limited to the performers, the project clearly added an extra dimension to the already complex interplay of musical, dramatic, architectural, choreographic and set-design elements that every modern opera includes.

Seven essays have been reproduced in this A4-size photocopied brochure, four of which are worth reading. Mark Reaney from Kansas University gives an overview of the experimental works done in Kansas. (His is the only text in English - very short and rather insufficient English summaries of the other papers are also included in the brochure.) Serge Lemouton from the Opera de la Bastille in Paris explains how Philippe Manoury has integrated computer music into his opera \*K...,\* based on Kafka's novel \*The Trial.\* Vincent Barthe, the director of \*Norma\* in the L' Ile d'Yeu production, comments on the musical challenges a contemporary performance of this classic opera poses.

Finally, and most interestingly, Francis Rousseau and Alain Bonardi from IRCAM and the Universite Paris VIII respectively, give a full analysis of the function of the "arriere-plan" or backdrop in the opera. Starting from a comment on a passage from \*The Magic Mountain,\* by Thomas Mann and guided by the adventures of Orpheus in Monteverdi's \*Orfeo\* (1607), they analyze the function of the backdrop as an artificial personification of otherness. Replacing traditional stage machinery by interactive projections, the artificial intelligence of the software becomes a form of "artificial otherness." The question is, according to the authors, whether the information technology will withstand a Turing Beauty Test, using "is it beautiful?" rather than "is it intelligent?" to distinguish between artificial and human. Their answer is, tentatively, that the opera (still) needs the human performer to fulfil its promises.

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ANNOUNCEMENTS
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< LEA Call for Papers: Artists and Scientists in Times of War >

Guest Edited by Shirley Shor  
in coordination with Michele Emmer, who has been working in this area with Leonardo since 1999

LEA is developing a special issue dealing with the phenomenon of war, and will explore the relationships between artists, scientists and war in contemporary society.

The issue will investigate war from an interdisciplinary perspective, as a cultural practice of conflict that affects each and every one of us on a daily basis; a practice that is broader and deeper than armed conflict between nation-states; that occurs on many levels when national, social, economical and cultural interests collide and which involves issues such as real-time media representation of facts, language and architecture, freedom of information and truth and power.

We are in a midst of a global digital media war where copyright holders fight consumers over digital music, books and movies sharing and duplication. A software war where open and free systems battle closed and proprietary ones for running the world's computer systems. A Man vs. Machine war in which the world's greatest chess players fight for the human creative edge and self dignity against the superior speed and memory of computers.

We live in a time of total screening of war as a spectacle on television and computer screens - from live war images on news cable stations, war simulation video games, reality police action shows and US Army commercials with heavy metal music soundtracks on MTV. We are moving further from asking hard questions regarding the essence of conflict and mediated reality and from being able to establish our own worldview based on cross-checked information and facts.

The issue will not present a specific unified position towards conflict but rather aims to reveal tendencies, to surface hidden agendas and issues, to reflect on multiple points of view and to open a wide-ranging dialog. What is the role of artists and scientists in this new era? Should art be completely independent of the politics of violence? Should science?

Guest Editor Shirley Shor and Leonardo Electronic Almanac seek papers discussing these and other topics that address the role and work of artists and scientists in times of war.

LEA encourages international artists / academics / researchers / students to submit their proposals for consideration. We particularly encourage authors outside North America and Europe to send proposals for articles/gallery/artists statements:

Proposals should include:

- a 150 - 300 word abstract / synopsis
- a brief author biography (and prior works for reference, if necessary)
- names of collaborators (if work is produced by a team)
- any related URLs
- contact details

Deadline: 16 May 2003

Please send proposals or queries to:  
Shirley Shor  
shirleys@friskit.com

or

Nisar Keshvani  
LEA Editor-in-Chief  
lea@mitpress.mit.edu  
<http://mitpress2.mit.edu/e-journals/LEA/>

.....  
< Call for Participation and Announcement - Digital Arts  
Histories >

Digital Arts Histories - A Birds-of-a-Feather meeting at SIGGRAPH 2003 - 27-31 July 2003, San Diego, USA, Digital Animation Room To be convened by Paul Brown on behalf of the SIGGRAPH Art Show Tuesday 29 July 2003 - 12:00 noon

Check the B-o-F Board at SIGGRAPH for confirmation of time and location.

This open-call B-o-F meeting is intended to bring together members of the international community who are interested in or involved with projects intended to archive, document and create historical and critical analyses of the use of and impact of computing and digital electronics in the arts. An early announcement has generated a significant interest in this meeting and it is hoped that several major projects will be able to report briefly on their work.

One intended outcome of this meeting is the formation of a committee to help plan an international workshop (in 2004) and conference (in 2005) addressing these and related issues. Another outcome is a special issue of LEA (Leonardo Electronic Almanac), devoted to Digital Arts Histories, to be published later in 2003. The convener - Paul Brown - is Visiting Fellow at Birkbeck, University of London, where he is working on CACHE - Computer Arts, Contexts, Histories, etc... an AHRB-funded project investigating the UK history from its origins to 1980.

<http://www.bbk.ac.uk/hafvm/cache/>

Further info:  
[paul@cache.bbk.ac.uk](mailto:paul@cache.bbk.ac.uk)

For more about SIGGRAPH 2003: <http://www.siggraph.org>

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< Aesthetic Computing Manifesto >

By Paul Fishwick, University of Florida  
<http://www.cise.ufl.edu/~fishwick>, <http://www.dagstuhl.de/02291/>  
E-mail: [fishwick@cise.ufl.edu](mailto:fishwick@cise.ufl.edu)

The application of computing to aesthetics and the formation of art and design has a long history, which resulted in the emergence of computer art as a new artform in the 1960s, with the integration of hardware, software and cybernetics. We propose to look at the complementary area of applying aesthetics to computing. Computing, and its mathematical foundations, have their own pre-existing aesthetics; however, there is currently a difference between the relative lack of variety of these aesthetics in contrast to art, which has a long history containing a multitude of historical genres and movements. We wish to strike a balance between cognitive and material aesthetics. Software as written in text or drawn with flow-charting may be considered elegant, but that is not to say that the software could not be rephrased or represented given more advanced media technologies that are available to us today, as compared with when printing was first developed. Such representation need not compromise the goals of abstraction, which is a necessary but insufficient condition for mathematics and computing, as meaning, comprehension and motivation may be enhanced if the presentation is guided by a pluralism of aesthetic choices and multiple sensory modalities.

Computer programs and mathematical structures have traditionally been presented in text-based notation even though, recently, substantial progress has been made in areas such as software and information visualization to enable formal structures to be comprehended and experienced by larger and more diverse populations. And yet, even in these visualization approaches, there is a tendency toward the mass-media approach of standardized design, rather than an approach toward a more cultural, personal and customized set of aesthetics. The benefits

of these latter qualities are: 1) an emphasis on creativity and innovative exploration of media for software and mathematical structures, 2) leveraging personalization and customization of computing structures at the group and individual levels, and 3) enlarging the set of people who can use and understand computing.

The computing professional gains flexibility in aesthetics and develops associated psychological attributes such as improved mnemonics, comprehension and motivation. The artist gains the benefits associated with thinking of software, and its underlying mathematical structures, as \*subject material\* for making art. With these benefits in mind, we have created a new term - "Aesthetic Computing" - which we define as the application of art theory and practice to computing.

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ISAST NEWS
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< LEA educators initiative >

Faculty and Students: Receive your FREE subscription to the LEA email digest at <http://mitpress.mit.edu/lea/e-mail>

The Leonardo Electronic Almanac (ISSN #1071-4391) is pleased to announce that is creating an abstracts index listing of Masters and PhD theses in the art/science/technology field.

Students

interested in contributing should contact [leo@mitpress.mit.edu](mailto:leo@mitpress.mit.edu).

LEA

maintains a discussion list open only to faculty in the field.

Faculty wishing to join this list should also contact

[leo@mitpress.mit.edu](mailto:leo@mitpress.mit.edu).

Leonardo Electronic Almanac (LEA) is Leonardo/ISAST and MIT Press' electronic journal dedicated to providing a forum for those who are interested in the realm of where art, science, and technology converge. This peer-reviewed e-journal includes Texts; Artists using new media; Feature Articles comprised of theoretical and technical perspectives; the LEA Gallery exhibiting new media artwork by international artists; detailed information about new publications in various media; Leonardo Digital Reviews of publications, events, and exhibitions.

Recent selections include work by Mark Amerika, Linda Carroli, Choy Kok Kee, Nina Czegledy, Oliver Grau, Teri Hoskin, Patrick Lambelet, Fatima Lasay, Geert Lovink, William Magee, Robert C. Morgan, Caleb Stuart, Alan Wallace

Job Opportunities submitted to LEA are posted in fineArt forum (the Internet's longest running arts publication), through a recent strategic alliance. The Leonardo Bibliographies project provides reading lists on emerging and key topics in the field.

The Leonardo Pathbreakers and Pioneers Art History Project provides key primary information for art historians. The LEA Archive provides comprehensive resource and documentation information. Access to the password-protected archive is provided with your LEA subscription.

To send thesis info / join faculty discussion list / other queries: [leo@mitpress.mit.edu](mailto:leo@mitpress.mit.edu)

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< OLATS News >

OLATS (Observatoire Leonardo des Arts et des Techno-Sciences):  
<http://www.olats.org>

1 - Artmedia VIII : online publishing of the proceedings  
<http://www.olats.org/artmedia8.html>

The proceedings of the International Symposium Artmedia VIII are now available online. This constitutes an ensemble of 37 texts, some in both French and English, on art practices and theoretical analysis in the field of Aesthetics of Communication and Net art, reactivating discussions held during the December 2002 symposium.

2 - New in Global Crossing: The Cultural Roots of Globalization  
<http://www.olats.org/setF12.html>

Opening of the " Links " section of the FCM project. In this section we present links to websites concerning questions about globalization as raised in this project. We are linking to websites concerning related events (symposia, exhibitions, etc.) and to artists' websites presenting projects regarding planetary issues and revealing particular relationships to global dimensions.

New text on-line: "Mapping the Database," by Karen O'Rourke and Sharon Daniel. This text presents two artworks (\*Subtract the Sky\* and \*Une carte plus grande que le territoire\*), which question our relationship to cartography. Cartography is considered an intersubjective manner of sculpting information and modeling communication.

The bibliography has been updated and new words have been added to the "Mots de la Mondialisation." The latter part is available only in French, but is worth a look anyway!

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< Leonardo Award for Lifetime Achievement - Call for Nominations >

Leonardo/ISAST offers one or more awards every year to recognize outstanding work in the areas of art, science and technology. Following the vision of Leonardo founder, kinetic artist and astronautical pioneer Frank J. Malina, the Frank J. Malina Leonardo Award for Lifetime Achievement recognizes eminent artists who, through a lifetime of work, have achieved a synthesis of contemporary art, science and technology. Former recipients of this award include: Gyorgy Kepes, Nicolas Schöffer, Max Bill and Takis.

We want to hear from you, our associate members, to find out who deserves recognition for a lifetime of activity, exploration and achievement in art, science and technology. If you would like to nominate an artist/scientist for the Lifetime Achievement Award,



please send an email with the name of the candidate and a brief statement describing your reasons for nomination to [isast@well.com](mailto:isast@well.com). All nominations will be sent to the Leonardo Awards committee for consideration. The recipient will be announced late in 2003.

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< Leonardo Music Journal News >

LMJ \*Pleasure\* issue now available

Pop music is unabashedly driven by the pleasure principle. "Serious" music, however, is usually perceived as more refined, or, to put it another way, repressed. But are pleasure and thoughtful invention necessarily at odds? Can there be no "bump and mind?" Find out in \*Pleasure,\* Vol. 12 of the \*Leonardo Music Journal.\* Included with the journal is the CD, \*From Gdansk till Dawn: Contemporary Experimental Music from Eastern Europe,\* curated by Christian Scheib and Susanna Niedermayr. The CD features works from throughout Eastern Europe by Tigrics, Olga+Jozef, Wolfram, and many more.

Order at  
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=4&tid=3>.

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Call for Papers: Leonardo Music Journal Vol. 14 (2004)

"Composers inside Electronics: Music after David Tudor"

"In my electronics . . . I try to find out what's there - not to make it do what I want but to release what's there. . . . The object should teach you what it wants to hear." With this simple but subversive recipe, David Tudor articulated a profound shift in the aesthetics of electronic music. Inspired by Tudor (and other composer/luthiers like David Behrman and Gordon Mumma) and aided by the Lego-like modularity of integrated circuits, the experimental music community in the 1970s adopted a new working method based on seat-of-the-pants electronic engineering. The circuit - whether home-made, self-hacked or store-bought but scrutinized-to-death - became the score.

A generation later, aspects of the Tudor aesthetic have spread well beyond the avant-garde: hip-hop, house and other forms of dance music and electronica share a similar obsession with the quirks intrinsic to specific pieces of audio gear. Every pop producer has a signature gizmo. The latest software plug-ins emulate obsolete but beloved hardware. We've become virtuosos of Tudor's practice of listening to the object, but the regularity and repetition of Techno could not be further from the tangle of Tudor's music.

For this issue of the \*Leonardo Music Journal,\* we invite authors to submit articles on any aspect of the work of David Tudor (both in its historical context and as it applies to music and art today), on the influence of Tudor's ideas on their own work, or on the role of technological idiosyncrasies in their composition, performance or production.

Deadlines:  
1 November 2003: rough proposals, queries  
1 January 2004: submissions of finished articles

Address inquiries to Editor-in-Chief Nicolas Collins at:  
[ncollins@artic.edu](mailto:ncollins@artic.edu).

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