

Art and the computer

David Sorensen

Volume 5, Number 3, Spring 1989

URI: <https://id.erudit.org/iderudit/9465ac>

[See table of contents](#)

Publisher(s)

Le Centre de diffusion 3D

ISSN

0821-9222 (print)

1923-2551 (digital)

[Explore this journal](#)

Cite this article

Sorensen, D. (1989). Art and the computer. *Espace Sculpture*, 5(3), 14–17.

Art and the computer

David Sorensen is a Quebec artist and associate professor of Fine Arts at Bishop's University, Lennoxville.

Please note that the second part of the article will be published in the June issue.

Automation and the arts

In an age of rapidly-increasing automation the artist finds himself faced with possibilities of considerable appeal: some say if Leonardo lived today he would surely be exploring with a computer. To others the artistic process seems to be irreconcilably opposed to high tech. Can we expect a future scenario in which the two will blend, or perhaps the appearance of two disparate schools, one unique expression coming from within the world of the computer, while another remains totally aloof and detached from it?

To some artists the rather difficult harmonics of these two realms have already been tapped and indeed put forcibly to work for well over a decade. With a broader segment of adventurers, a thrust that could constitute a popular movement is underway; a multitude of computer artists, media people or do-it-yourselfers, often with little formal art background, are producing work that, though inappropriate for the gallery/museum circuit, is vast in its implication as a new and radical form of communication. Conversely and within the art field, some rare pioneers have inadvertently laid what could be the foundations of an Academy in Computer Arts.

In the education field art comprehension is being taught in innovative ways on the computer and programs of great variety are being developed to teach hundreds of thousands of students from the elementary levels up (1). The contemporary music industry has

been indelibly altered since Robert Moog introduced his first synthesizer in the early sixties, and much in the way the printing press contributed to the demise of the oral tradition the computer is predicted to subtly and gradually alter our lives, our art forms, and our very thinking patterns.

Symposium

At a recent conference in Philadelphia, the 1988 "Scan" Symposium (the Eighth Symposium on Small Computers in the Arts), during three days of workshops on music, education, and art, a board of sculptors moderated by Jon Fordyce, the Ohio artist and educator, explored existing and potential computer-assist sculptures in our milieu.

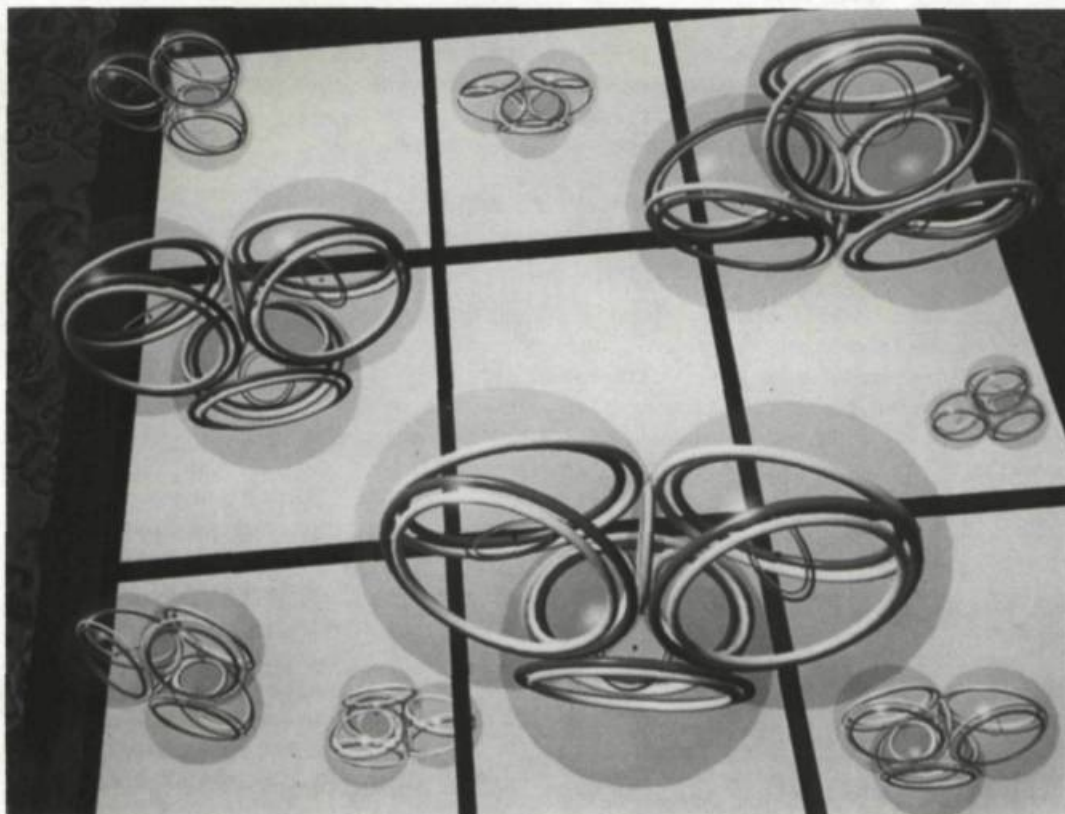
Rob Fisher, *Skyharp-Osaka*, 1986. Computer graphic.



An impressive board of panelists included Tim Brock and Licio Isolani, 3-D design educators from Pratt Institute, Rob Fisher, co-author of "The Design Continuum" from the College of Engineering at Penn State University, David Morris, sculptor and teacher of computer graphics and interior design from the School of Visual Arts, N.Y.C., Steven Pevnick, of the University of Wisconsin and recipient of the 1988 award at the Chicago Navy Pier Art Fair for his innovative computerized fountain, Ron Coleman, computer expert and long time fountain specialist from Bowling Green State U, Ohio, as well as international sculptor Kenneth Snelson, best known for his tensegrity pieces and now exploring atom structures on an Iris computer, and myself, a neophyte in the field, developing a sculptural color panel that gauges variation in electrical consumption in a small city. These panelists shared and exchanged views on the pros and cons of technology and its effects on art forms in their current production. In addition, Manfred Mohr, a pioneer in the field, was consulted in his New York studio.

Technical information:

A concern of many was that of approach: how does the artist integrate the new technology into his or her creative flow? Once the needs have been defined, to explore or add to his present repertoire he seeks appropriate software programs (graphic design software, for example, provides rendering or



Kenneth Snelson, *Invasion of Cyclopropane*, 1988. Computer image

multi-angled visualization of a sculpture), and then the hardware (the actual computer 2) to run the chosen program. Isolani and Brock described the operational process: various types of polygons (multi-sided planes) are projected onto a cartesian planar coordinate system (x,y,z) on the screen. A point is a very small four-sided polygon, a line a long narrow polygon, a plane a single polygon, a volume numerous polygons connected to suggest a solid. Drawing combinations in wireframe (a see through 3-D, connect-the-dots method) enables composing of basic 3-D geometric forms such as cubes, spheres, cylinders, and cones, or more complex combinations. Free hand sketching on the screen with the aid of a hand held "mouse" or graphic tablet and digitizer allow for further transformations. Images can be stored and recalled or, if print-out equipment is available, recorded on paper or canvas.

Animation

Beyond three-dimensional representation animation provides a fourth dimension, that of movement or rotation in time. "... through interpolation, points can transform into lines, lines into planes. A single plane, while rotating, can transform into a curved plane; a curved plane can transform into a

double curved plane and so on. A simple interpolation from a plane to a double curved plane, for instance, consists of two workspaces containing the same number of polygons. The computer then averages the in-betweens, articulating the transformation over time. ... time becomes another axis for compositioning."³

New Approach

In addition to these abilities, enabling us to produce drawings and even tonal renderings for ourselves or for a client, we were informed of the computer software writers new approach to us, the artists. Fordyce's introduction and his article in the "Proceedings" pointed out that "until recently, highly capable 3-D solid modelling computer graphics had been the exclusive dominion of a few computer programmer/sculptors who reside within corporate or academic walls". But now... "one trend has been to package ever-greater computing power into ever-smaller physical computer chips. The megabyte plus computer memory requirements of 3-D solid modelling can now fit into competitively priced table top computers (for under \$1000.00 any of us can have truly amazing 3-D computer graphic system in our studio) ... and ... "despite the fact that these new products have been developed primarily for commercially oriented designers who will use them to produce inexpensive animated computer graphics television advertisements, the sculptors of the world also profit."

These notes of optimism led directly to exposition and discussion with the individual artists. How has the computer served as an assist in each case, and conversely what limitations has it presented?

Kenneth Snelson: structured explorations

Kenneth Snelson is an artist who moves effortlessly forward in his creations. In his early "tensegrity"⁽⁴⁾ sculptures an elegance and sparseness define his connection with the underlying forms of nature and even demonstrate a somewhat remote association with science. These works reveal a directness, a crystalline structural integrity that evidence

5a lightness of spirit and a poetic orchestration of elements. What Buckminster Fuller made tangible through building and architecture Snelson expressed in the realm of sculpture. Indeed the two men worked together at Black Mountain College in North Carolina and Snelson's "tensegrity" propositions keyed many of Fuller's inventions.

Snelson's training with Fuller, Joseph Albers and Willem de Kooning at Black Mountain led him to The Institute of Design in Chicago and further to the Atelier Fernand Léger in Paris. From these Bauhaus/constructivist-based schools he assimilated both a feeling for the graphic elegance in elementary structures and for the extensive lightweight spanning potential of modular planning. Numerous exhibitions and commissions executed from the late 50's through the 70's in the States, Europe, and Asia have established him now as a major figure in his field.

Snelson's fascination with the module which underlies his "tensegrity" works can be re-discovered in his ongoing research on atomic structure. His first questions remain constant in his vision: "What kind of inner organization determines space-structure arrangements? What really makes things stay together and manifest in tension-compression relationships?" A modular hollow tube, a compressive element held inertly in space by a tensed cable can contribute, in conjunction with other modules and cables, to a configuration that hovers and floats weightlessly in space. Images and structures, both from nature, (the skeletons of flared and floating dandelions), and man-made, (kites, itinerant tee-pees, and bicycles) ally themselves with Snelson's sensibility.

The atom to him is the ultimate module, the working ingredient of the known universe. And so what could be more

natural than to investigate its inner dynamics? The spaces, the crystalline orderly pattern, the internal forces determining its angularity or curvature, its working mechanics, and most importantly its actual appearance; these issues fascinate Snelson. In the past few years, setting "tensegrity" propositions aside, he has courageously moved into computer technology and with the aid of a Silicone graphics Iris 3130 mode with Wavefront technologies software(5), a computer created to do 3-D graphics and animation, he is schematically exploring and documenting a unique principle that has fascinated him for decades... atomic structure.

Though Snelson concurs generally with most computer artists that, given a long and arduous introductory period, this technology can be very useful and efficient in the areas of graphic representation and rendering, he still hesitates to rely on it for more complex problem solving. Perhaps as the technology evolves and becomes more time-efficient a future computer may be able, for example, to portray a random sized tubular member on the cartesian grid of the screen, locating it via a polygon and number system with a series of commands, appropriating a comprehensible angle and the required force and stress in the overall structure; but thus far it is still far easier and faster to build a maquette. Surface texture-wrapping, color and tone application, illumination, animation, and backdrop mapping with perspective grids are available and estimable now.

The computer, once the problem and program is defined, can achieve results comparable, even superior, to an air brush artist, in a reasonable fraction of the time, but structural projection is still not the property of the computer artist. Snelson reports that a 74 cable, 16 tube arrangement took him four days to 'draw' on a computer whereas a model was built, in a more direct, and 3-dimensionally more fulfilling way, in one day.

Snelson, with typical modesty describes himself as a kind of modeller, using a method close to that of a clay sculptor. His concern with form is on the level of internal dynamics represented by modules, so he emphasizes structure rather than mass, but he still arranges his elements much in the way a modeller would sculpt a form, piece by piece, lines replacing daubs of clay.

When questioned on the relationship between science and art he talks of a certain dissimilarity of goals, but also of bridges between the two fields. For example to Snelson the atom is really a subject of public domain; neither the artist nor the scientist can lay claim to it with exclusivity. The scientist, with laws and proofs, has little interest in what his topic actually looks like, what its natural manifestation as form is, whereas this is a point of entry for the artist. Perhaps each discipline can feed the other even though their defined requirements are seemingly contrary.

Snelson says he uses science and science books much in the way a tableau painter might use a library and historians to research a topic. If such an artist were to paint a canvas on the civil war, for example, he or she would need to know which captains, what kind of horses, what colors, what kind of foliage was involved. Similarly Snelson investigates the information that science can supply him with and he can occasionally use this material as a point of departure in his art.

In the instance of the atom, Snelson saw a dream come true in the late 70's when the price of computers dropped significantly and he could finally make real the visualization that had played in his imagination for years. The graphic computer image rather than a sculptural

one defined a final lightness and transparency appropriate to the atom.

Snelson entered a no-man's-land between science and art in pursuing his curiosity but pays tribute to his computer as an aid that "when doing its job properly... is a genuine-spirited, willing slave, entirely at ease with requests that require it to stay awake all night in order to render a multi-megabyte picture in time for breakfast. Even so, my dream of a fully animated tour through my invented submicrocosm will require more months, even years, than I ever imagined..."⁶

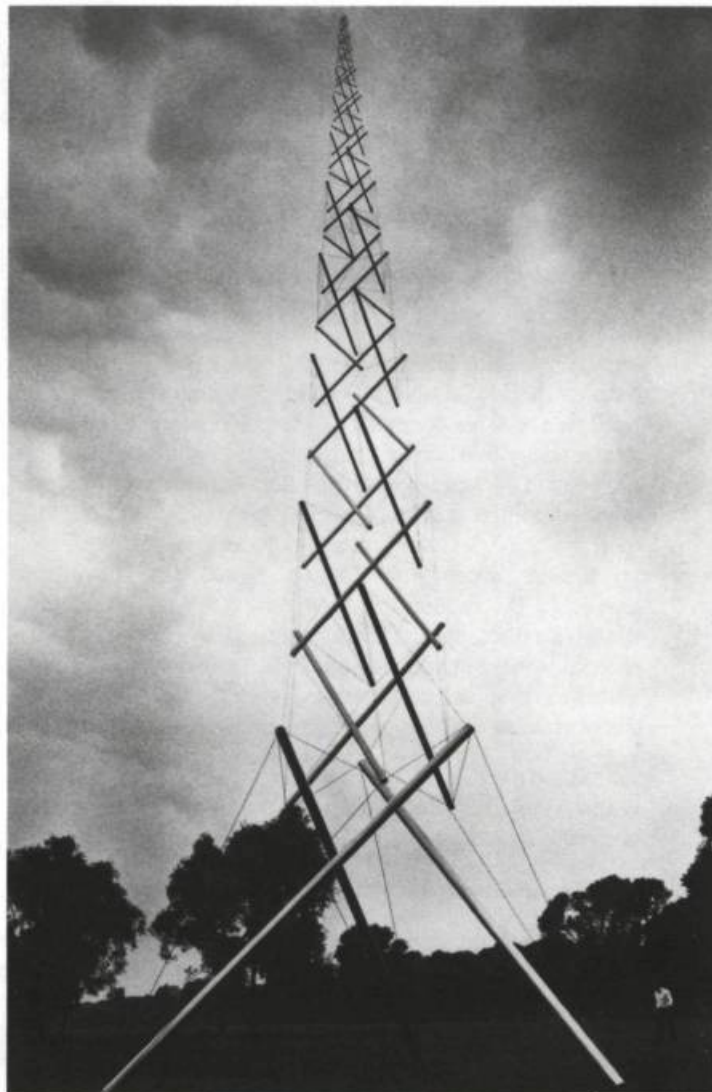
The results of his initial research are on view in a touring exhibition called "The Nature of Structure", which opened at the New York Academy of Sciences in Jan. 88 and runs until Apr. 89, then goes to the California Museum of Science and Industry (June-Aug. 89), and finally the National Academy of Sciences in Washington (Apr.-June 90).

By gliding and bridging from one discipline to another in search of the common principle Snelson reveals not only the humanism of an artist but also the wonderful curiosity of a true scientist.

Rob Fisher: Atrium Design

Rob Fisher, the co-author of the Design Continuum, a comprehensive survey of design principles published in the sixties, has become fully immersed in the computer age. In a number of large scale commissions, complex mobile configurations that are often suspended in the space of multi-levelled atriums, he has found the need to pre-calculate and pre-visualize a wide range of components for two reasons: first to present clear images to his client, who often speaks a different language than he, and secondly to better understand the space he is dealing with as it is often on a different continent than his studio.

Kenneth Snelson,
Needle Towers, 1968. Aluminum and stainless steel. 60 ft. High.
Collection of the Hirshhorn Museum and Sculpture Garden,
Washington, D.C.

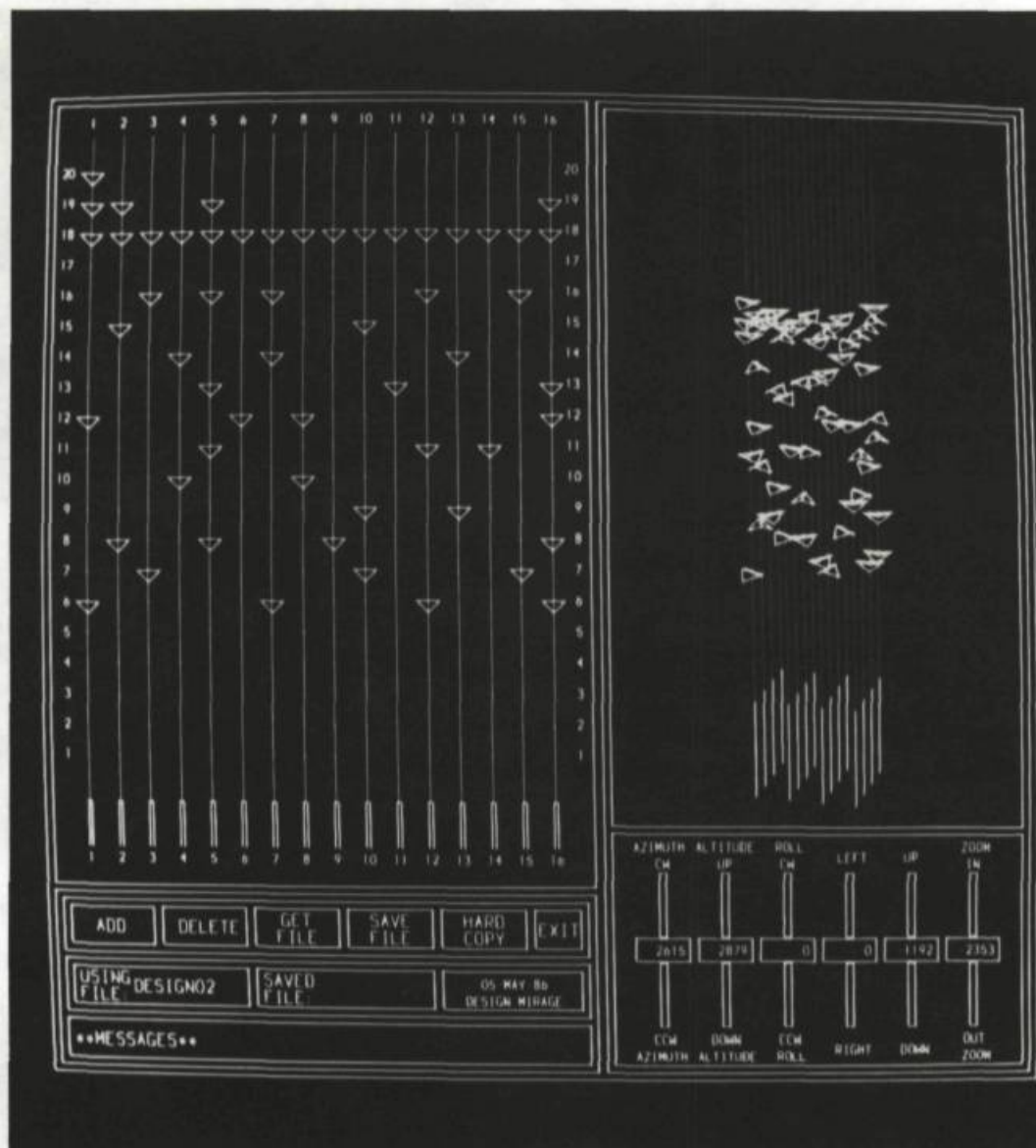


In a Osaka commission for Hilton International he had to pre-visualize the interior space of a three-floored, vast open atrium that would be filled by hundreds of delicate floating aluminium shapes suspended on fine lines and anchored in place by stainless tubes at their lowest extremities. Fisher uses up to five computers ranging from Commodore Amiga 500 (serving Deluxe Paint, a powerful graphics program from Amiga), DEC Micro Vax GFX (processing 3D data from architects plans as well as Fisher's preliminary sketches of the work), 3 Evans and Sutherland Computer Graphics workstations (to achieve exact dimensions and locations of each component of the sculpture) and Stereo 3-D (assisted by color-glasses to distinguish background environmental data from the interior workings of the sculpture). In wireframe too many lines simply become a jumble and, as he has often not seen the actual space, composing bunches of lines with aluminium elements at different heights, then locating them in the overall configuration, requires clear 'walk around' viewing and high resolution 'real-space' visualization.

With an assistant, Ray Masters, who writes unique and ingenious programs to resolve the given problems, Fisher has managed to successfully overcome practically all the limitations a non-computer situation would present.

He even feels his sensitivity to real space has increased in a Zen-like way since using computers and Stereo. The surroundings now compliment and emphasize the emptiness of the space. Through the forward-receding resolution that Stereo revealed to him the newly defined in-between space is now much more visible in everyday situations. He concludes that the process has led to new perceptions, changing assumption to knowledge.

The experiential dynamic of the realm of form in real space is very hard, if at all possible, to duplicate. The complexity of eye and hand intuitively at work are Fisher's goal on the computer. By programming in such a way that the creative process in uninterrupted in any way, he comes close to duplicating the studio situation. This means pre-working much of the program so that stored images are solved and available like inner thought patterns. One such animation program has two active areas,



Rob Fisher - Simultaneous Viewing on computer program "Control" used for composing "Skyharp - Osaka", 1986.

one for defining individual clear frames, a second for storing and editing view sequences.

'Control', a program that Masters wrote, is able to locate his aluminium elements at different heights on a vertical scale, grouping a number together in one window, and simultaneously view them in rotation in a 3D, 'real space' situation in a second window.

Fisher advises artists to use and maintain all existing abilities and techniques and *then* to refer to computers, not to depend on video color as it is too intense, but to use it only for rough estimating (computer offers 17 million colors), and to employ computers not to duplicate the existing, for drawing updates, etc., but instead to use it at the conceptual level where it can enhance his ability to make decisions in new ways.

- 1 Pamela Sharp, *ZoeTropes*. Art Department, San Jose State University, California.
- 2 Suzanne Langer, *A work of art as a public form of feeling*.
- 2 Computers running graphic design software are Apple, Atari, Commodore, IBM, Tandy, Texas Instrument and NCR.
- 3 3D Design and the Cartesian Coordinate System in the Computer Licio Isolani and Tim Brock.
- 4 Tensegrity = tension and integrity
- 5 Produced in Santa Barbara
- 6 Catalogue: Kenneth Snelson "The Nature of Structure". The results of his initial research are on view in a touring exhibition called *The Nature of Structure* which opened

at the New York Academy of Sciences in Jan. 89 and runs until Apr. 89, then goes to the California Museum of Science and Industry (June-Aug. 89), and finally the National Academy of Sciences in Washington (Apr.-June 90).

Coming: David Morris, Steven Pevnick, Jon Fordyce, Manfred Mohr. Compiled by Yolande B. Auger on Atari 1040 ST

La traduction française de ce texte paraîtra dans le prochain numéro de juin.