CSURI
Károly

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The Artist and the Computer

Charles Csuri's film "Real Time" opens on a man sitting before what appears to be a television set, painting on its surface with a "pen" that transcribes tracer-thin lines of glowing light. Rock music pulses in the background, while vivid fluorescent colors drench the screen. "Here I draw an eye," Csuri, the narrator, says, "and there I draw a mouth. The computer makes them move along the paths I choose." Magically, the eye and the mouth do precisely that, circling each other like an early Picasso set in motion. It is Csuri's hand and mind that make the forms, but attached to the cathode-ray tube (CRT) is an electronic mind, the computer, responding to the artist's touch, moving the drawing this way, that way, in dozens of different combinations. Furthermore, the computer is "storing" what Csuri has made, for future re-creation on the tube.

The process is interactive, man and machine working together, reacting to each other, in a living, moving way. If this contradicts the notion of computer art as stiff, cold and mechanical, there is more surprise ahead. "Whatever I decide to do," says the narrator, "is translated immediately into fact, in real time. The moment of the artistic idea is the moment of its creation. The editing is instantaneous."

Athletic: Csuri's film, which catches the essence of computer art as it stands now, ends with an athletic display of the computer's ability to endlessly maneuver any form. A tiny helicopter, daubed in brilliant red, flies over and around the screen, turning up, down, on its side, the instant it is commanded by the artist. This is a far cry from the early computer drawings, stiff, flat and uninspired, that appeared in art galleries, museums and magazines five years ago. More important, it presages a totally new approach to the drawing of images, an approach that involves not only the dimensions of depth and movement but also active collaboration with a responsive electronic partner.

The computer is a fast-developing tool in all the arts. Composers can deploy sound patterns through its complex decision-making. Programed with vocabulary and syntax, it has produced arresting and original poetry. It will in fact perform any task reduced to numerical equations, even choreography, via "programs" (instructions) normally created by a computer professional working in collaboration with the artist. But nowhere is the unique character of computer-assisted and generated art more clearly visible than in the burgeoning field of graphic displays and films. Computerized music and poetry often have an ambiguously "human" tone. But to look at the unbelievably elaborated "snail" produced by a California Computer Products (Calcomp) engineer (employing a line spiraled so thin that it would stretch almost a mile if uncurled), or to watch a Csuri drawing unfold on the CRT screen—his "Hummingbird," for example, which generates 14,000 modulations on one form—is to see something else, beyond but including the human. It is nothing less than a totally new force in the arts.

Calcomp and Csuri are hardly isolated examples. The art of computer graphics is being extended daily, on both the hardware and software levels, throughout the world. Very little of it has been properly seen in the U.S., for many reasons. The "studios" are found where the machinery is, on campuses and in corporation headquarters, such as IBM in Los Angeles, far outside the well-traveled art-world network. And the "artists" include scientists and engineers as well as artists. Furthermore, the American art establishment continues to look upon the art-technology interface as a pleasant sideshow, leaving the serious work to European museums. The Institute of Contemporary Arts in London presented the first extensive exhibition of computer-assisted art in 1968; "Impulse Computerart," a show with finer focus, organized in Germany, is now touring Europe, with stops ahead in Greece, Italy, Spain, India and Japan, but not the U.S.

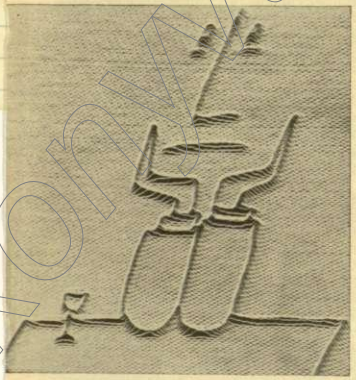
But creation and experimentation is something else. There the United States is ambitious and productive. It was at Bell Telephone Laboratories in New Jersey that some of the earliest discoveries were made. In 1962, research engineer A. Michael Noll, prompted by a colleague's programing error ("Crazy pictures came back on the plotter," he recalls, "lines going all over the place"), decided to see whether the computer could draw for art's as well as engineering's sake.

Csuri at the CRT: Interactive

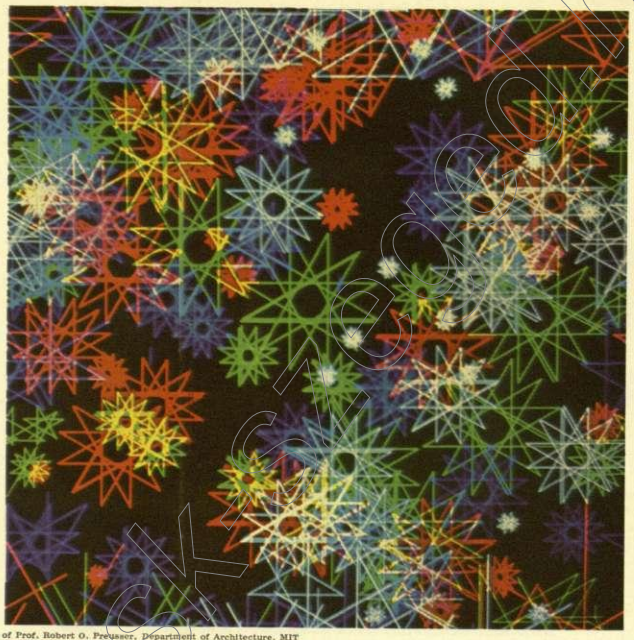
At that time, however, computer graphics were rigidly precise line drawings made on magnetic tape by a plotter, or motorized drawing stylus, regulated by a computer. Noll and some of his associates programed the computer to swirl and circle, even to produce random linear patterns. On one occasion, Noll instructed the computer to generate a Mondrian-like drawing. When 100 "subjects" were asked their preference between the computer's work and Mondrian's, the computer won. This led Noll to predict—in a 1967 essay, "The Digital Computer as a Creative Medium"—that man would one day *share* the creative function with the machine.

Complex: His prediction is being realized now on many highly functional levels. Scientists and engineers are using computer graphic displays to simulate the visual implications of their theories; architects are programing the computer to "finish" and "correct" their drawings.

Csuri, a former All-American tackle at Ohio State University, where he now teaches, uses the computer creatively. In 1967, he fed the machine the image of a man, as mathematical formulas, then programed the plotter to change the face via the sine-curve equation, resulting in "Sine Curve Man," a complex blend of reality and mathematics that had a strange emotional power. At other times, he produced serial distortions of faces, bodies and limbs, all capitalizing on the ability of any computing machine to "vary" themes more quickly and precisely than a man. His "Hummingbird" methodically picks the drawn bird apart, scatters it around the screen and puts it back together again. Backed by a Nation-

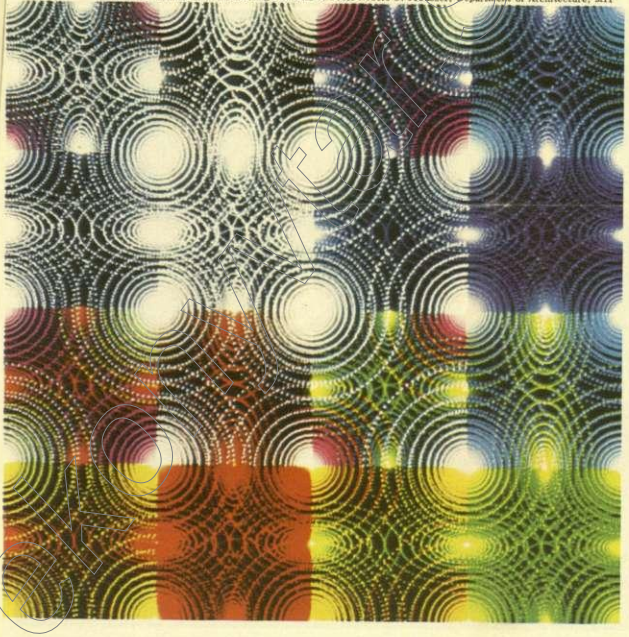


Computerized Steinberg: Lacy 3-D



A digital computer was programed to draw random patterns of twelve-pointed stars, varying in size, on its oscilloscope screen. The final picture is the result of making multiple exposures of five separate patterns through red, green and blue filters.

Designs by science and engineering students of Prof. Robert O. Preusser, Department of Architecture, MIT



Here an error made by a digital computer produced a series of subtly different spirals. These spirals were repeated in various forms on a grid structure and shifted vertically and horizontally to make a composite photograph.

Lillian Schwartz and Ken Knowlton, © 1970

This nude began as a color transparency. A computer then substituted an 'alphabet' of tiny symbols for the light levels of the photograph; then color was added by the silk-screen process.

An interactive computer was used to create this spiral. The artist experimented with images on the screen, then programed the machine and photographed the form through color filters.

John Mott-Smith, Air Force Cambridge Research Laboratories

al Science Foundation grant, Csuri has since advanced the art of computer animation still further by adding color to the process.

"I can not only make a moving drawing on the CRT," he says, "I can explore a whole new world of forms. That gets a little technical. What I might be saying is that mathematics offers totally new possibilities . . . You can use things like a 100-dimensional geometry . . . You can generate very complex patterns." In his newest program, Computer Driven Animation, now at the IBM display center in New York, seemingly simple geometric forms expand, contract and float in space; the viewer can press a light pen to the face of the CRT and turn the forms onto any desired angle. "The computer gives you an XYZ space to draw in," he says. "The effect is like drawing with light in three dimensions."

Sensual: For Csuri, drawing is now a vital art form with an electronic base. But the computer can also be programed to run off drawings in the old sense, with its mechanical arm, the plotter. The results are not only sophisticated in form, but surprisingly sensuous. Michael Noll's colleagues at Bell, Kenneth Knowlton and Leon Harmon, even managed to produce a 5-foot-by-12-foot computer "nude," based on information fed into the machine from a photograph. At the Massachusetts Institute of Technology, Prof. Robert O. Preusser has let his students loose on a variety of intriguing visual exercises. In one case they converted the brilliant and witty drawings of Saul Steinberg into lacy 3-D abstractions. Elsewhere, engineers Leonard Kilian and Campion Kulczynski have created a thickly articulated "Black Star" out of an endlessly swooping line. John Mott-Smith has produced bewitching color by photographing patterns on the CRT through filters and layering the resultant images one upon another.

Most such works, despite their beauty and technical complexity, merely refine images familiar to any student of contemporary art, or mechanically play out conventionally structured programs. They are "fall-out" art, made by men whose major commitments are elsewhere. The number of first-rate artists with consistent access to the computer is slim indeed. They include Stan Vanderbeek, who has made computer films at Bell; Lillian Schwartz, who has collaborated on a number of strikingly abstract sequences with Knowlton (and is also producing some fascinating futuristic computerized musical instruments); and John Whitney, IBM's first artist-in-residence. Only Whitney has been able to devote himself completely to the new tool, since the 1950s. "Matrix," his latest film, uses nothing but horizontal and vertical lines, squares and cubes; they move along a closed pathway on the screen, advancing toward the viewer, retreating, mixing with each other, regrouping and coming back again, in response to a purely mathematical formula.

IBM instructor, girl with light pen: The verdict is rendered by men

Whitney is delighted with this film and with its ability to deal with "periodic" movement. But he still speaks—like everyone else in his field—of beginnings only. "I am not that young," he says, at the age of 54, "but I hope you can share with me the promise I see in all this." This combination of confidence and impatience is shared in varying degrees by many others. There is a strong feeling that visual athletics aren't enough, that an intelligent tool is still awaiting the maturation of an intelligent philosophy to guide it.

Forms: Sculptor and critic Robert Mallary, who teaches at the University of Massachusetts, is a prime spokesman for this position. "It is important," he says, "to move toward computer-generated art as well as computer-assisted art." Toward this end, he is trying to develop a program that will encourage the computer to make its own decisions about form, either two- or three-dimensional. "The first results have appeared as plotted drawings, dealing in highly simple shapes," he says. "We will work up from here."

Despite the Frankensteinian overtones in this statement, Mallary is seeking no more or less than the essence of his medium, a thoroughly computerized art, like Matisse investigating the essence of color. In very different ways, both Siah Armajani, an artist, and Ivan Sutherland, an engineer, are looking for an indigenous computer esthetic. Armajani's films and drawings result from asking the computer improbable questions and abiding by the results. His film, "To Perceive 10,000 Different Squares in 6 Minutes, 55 Seconds," might be called an epic of visibility. Throughout its six minutes, nothing at all seems to happen to the innocent square on screen. But actually one is watching 10,000 different squares, each infinitely smaller than the last, the final one an imperceptible one-hundredth of an inch smaller than the first. "The computer is an influential nervous system," says Armajani, "not just an adding machine."

Sutherland is refining the techniques of computer display at the University of Utah (as are other scientist-artists such as Ronald Resch) to a degree beyond anyone else. In addition to the perfect calibration of color and 3-D shapes, he has constructed a viewing helmet equipped with two tiny cathode-ray tubes for the eyes. Thus equipped, the viewer can be placed within a "real" world simulated by the computer. The options open to an artist or programmer in this situation are limitless. "I think of a computer display as a window on Alice's Wonderland," Sutherland says. "I can put you into the cockpit of an airplane, or send you speeding down a road at the speed of light."

There is no image that a man cannot make now, given his imagination; there are more images to come from beyond the imagination, locked now in the forest of electronic circuitry, waiting only the programmer. If the hand of man is missing from this kind of draftsmanship, his mind is not. Even in those cases where the computer is programed to make its own choices, now completing a form, now extending it, the final verdict is rendered by men. The poet Marie Borroff, after a year's collaboration with computers, pointed out in a recent issue of The Yale Review that the subtlest programed poetry has meaning only for men. The motorized plotter behind Csuri's "Sine Curve Man" merely transcribed linear patterns. The creative act is performed by those of us who see into it, who see both its fluidity of form and what that form portends, for the future of art and of man.

—DOUGLAS DAVIS