Their images are totally synthetic. In *La famille Camembert* (p. 330), coordinates were fed into a computer denoting a number of points that would have resided on the surface of one of the faces if it had been a real, physical object. Then, using a technique called the bicubic B-spline surfaces computation, a "surface" was computed that ran near each of the specified three-dimensional coordinates (but not actually through them).

Once this representation of the face had been described mathematically, Nahas and Huitric applied "tricks" via their software, "le système Rodin," to determine how light would reflect off it, where shadows would occur — even a sense of perspective (based upon an assumption of where the light source and viewers' eyes would be). The software also allowed them to create surface modulations or deformations in their images for added texture. (In experiments along this line last year, they modeled a dinosaur based on surface points measured from a balsa-wood skeletal-model kit they assembled. Afterward they deformed its surface to simulate a furry coat. The furry dinosaur "wasn't beautiful," recalls Requicha, "but it was cute.") Final works contain a composite of images that the Rodin program has melded mathematically.

Nelson Max, at Lawrence Livermore National Laboratory, got involved with graphics as a means to visually demonstrate mathematical concepts. However, he says, "People would look at a film, appreciate its beauty and give me all kinds of compliments. Eventually I just started thinking of myself as an artist."

"You see, I can't paint," Max says. "But I can do the mathematics and the programming" necessary to make an imagined scene appear on a computer display. "So the computer allows me to create fictional worlds I would not otherwise be able to," he explains.

Carla's Island (p. 329) is a high-resolution enhancement of a single frame from a four-and-a-half-minute movie by the same name. "Everything in the picture was done with polynomials and trigonometric functions," Max points out. For example, his islands were initially modeled as a couple of paraboloids "I just stuck into the ocean," he says. When viewers told him they looked "like breasts popping up out of the water," however, he decided to superimpose waves atop them to form rolling hills, added a "California"-style beach, and then stuck a cliff above it.

Color, lighting and reflections were determined by "ray tracing," a technique that follows the path of hypothetical light rays — emanating from the viewers' eyes — as they would bounce off and between objects in the field of view. Unlike the other artists described here, Max works with a Cray I "supercomputer" — one of the world's fastest. But to use the machine efficiently, Max had to "vectorize" his ray-tracing algorithms (mathematical procedures). "And that's not the way people normally think about ray tracing," he says. Normally they would analyze the path of one ray to completion before tackling the next. Max had to tackle 100 or more and sequentially compute the first step of each ray's path, before returning to sequentially calculate the second step. And so on.

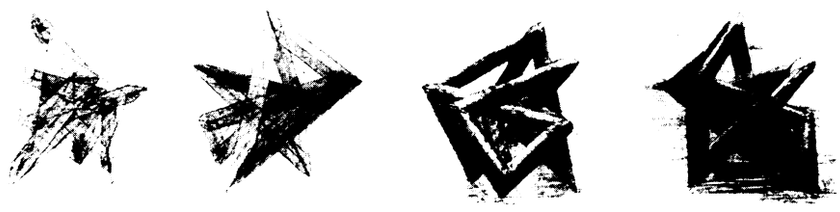
"The conventional art world doesn't really think of art as being technological," says Veeder, a rather nonconventional artist from Chicago, "but it really is." The introduction of spatial perspective in drawings and the development of paint in tubes — those were technological innovations that brought revolutions in art, she says.

"I don't have a very good mathematical background," admits Veeder, "but the main thing about computers is not mathematics, it's logic. Things like sine waves," for example, "are very powerful organizing forces in nature. And for artists to be able to interact with things in terms of logic is something that appeals to a lot of us," she says. "It's very intellectual."

But the computer's appeal has not yet become universal. When artists from other disciplines look at computer art, Slayton says, they often complain that "all you did was expedite what you could have done with your hands or mind. And to a certain extent, that's been true," he concedes, adding that that is changing.

Nonetheless, an antipathy toward computers has limited the ability of some artists to gain exposure. "Galleries don't particularly like [computer art]," Slayton contends, probably because they don't know what to do with it, how to display it or how to evaluate "sensibilities of the technology and its relation to the message." But "there's a whole new esthetic from which this discipline is just now emerging," he says. And art exhibited at Siggraph this year offered a glimpse into how that is being expressed. □

Perspective drawings of sculpture, rendered by Calcomp 1051 plotter, were hand-colored. Tektronix-4052 and Amdahl 470-V8 computers were used to compute coordinates.



Smullin 1981/Siggraph 82

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The Care of Reptiles and Amphibians in Captivity — Christopher Mattison. What you need to know in order to keep and breed reptiles and amphibians at home. Detailed notes are given on the management of 200 different species. Blandford Pr(Sterling), 1982, 304 p., color/b&w illus., $17.95.

Cataracts: What You Must Know About Them — Charles D. Kelman. A leading eye surgeon explains in simple language what cataracts are, how to decide whether a cataract operation is necessary and beneficial for you and exactly what the operation and the postoperative procedures are. Crown, 1982, 86 p., illus., $9.95.

Follow the Wild Dolphins — Horace Dobbs. A heartwarming story and a fascinating study of a human relationship with the most amazing and intelligent of all creatures, the dolphin. Tells of the friendship that developed in the Irish Sea between scientist/diver/photographer Dobbs and a bottlenose dolphin called Donald. Discusses human contact with other dolphins in the wild. Dobbs makes a plea for a halt to the senseless extermination of dolphins by fishermen, the pollution of the undersea world and dolphin captivity. St Martin, 1982, 263 p., illus., $15.95.

North American Horticulture: A Reference Guide — Compiled by the American Horticultural Society. A wealth of information for the professional and the amateur interested in horticulture. Lists horticultural organizations, plant societies, educational programs, public gardens, botanical and horticultural libraries, conservation groups, government programs, horticultural books and periodicals, together with much other useful information. Scribner, 1982, 367 p., $50.

Phobia: A Comprehensive Summary of Modern Treatments — Robert L. DuPont, Ed. While phobias have been found among all cultures and have been widely recognized in all periods of history, it was not until the 1970s that new developments revolutionized the treatment of phobias. This book includes the major papers presented at the 1980 Washington Phobia Conference, giving new information about the treatment of phobias written by pioneers in this field. Intended for interested health professionals, phobic people and their families. Brunner-Mazel, 1982, 252 p., $25.

Spacewar — David Ritchie. From the early experiments of Robert Goddard to the sophisticated technology of killer satellites and future plans, this book for the general reader tells the story of the military uses of space. A list of recommended readings and a bibliography are included. Atheneum, 1982, 224 p., illus., $14.95.