The Computer and The Image

Computers' ability to manipulate and create images has changed radically in the last twenty years. Images take large amounts of memory to store, and correspondingly large amounts of computer time to process. Computer imaging of all kinds has benefitted directly from the steady decline in the cost of computer memory and processor cycles. Still most uses of computer graphics and image processing are confined to the workplace and research laboratory. For example, the animation possible on a personal computer is based on stick figures, in contrast to the 1984 two minute "cartoon" with three-dimensional figures made by Lucasfilm with the help of a Cray XMP and ten VAXes.

The image gallery both reflects the history of this application and provides a glimpse into the future. Many of the fruits of computer imaging are easily comprehended, yet are rarely seen in public. Those programs that run off the Museum's mainframes will undoubtedly be available one day on the individual workstation or home computer.

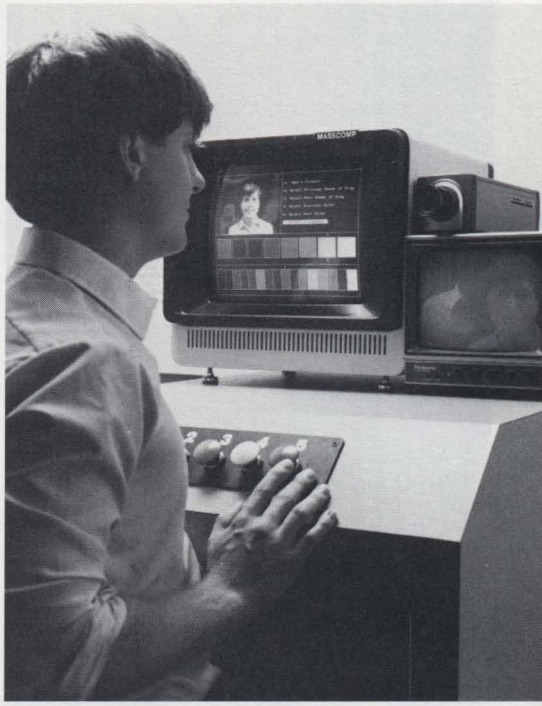
The gallery's frontispiece is a large Landsat mosaic spanning a 300 mile square region of Southern New England and New York. The image relied on digital techniques, both for its capture (there is no camera on Landsat, only an instrument that measures the brightness of one point at a time) and for its enhancement and assembly.

This leads into a section on image processing. Working exhibits allow the visitor to degrade the resolution and number of shades of grey on a digital image of his/her own face and pan around a Landsat picture of eastern Massachusetts showing detail down to a scale of 30 meters.

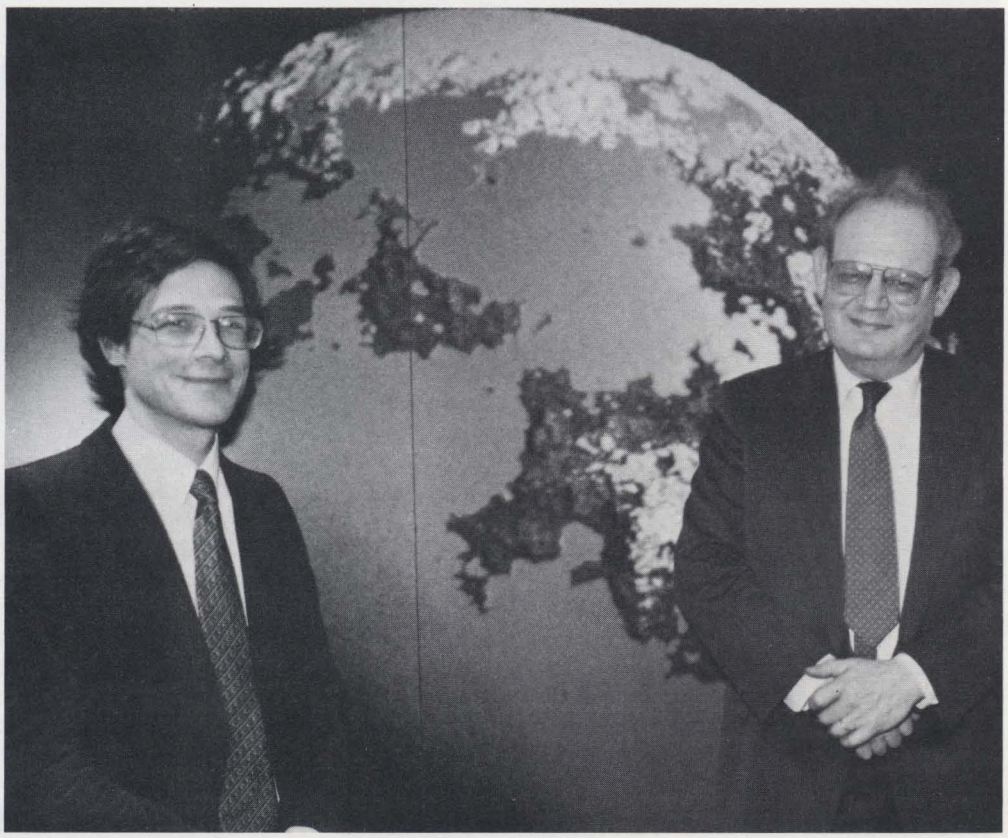
On display is the first picture of another planet taken from a vantage point in space. The data was sent back by Mariner 4 during its 1965 Mars fly-by. While the data slowly emerged from the printer, the project scientists, eagerly awaiting their first closeup view of Mars, hand color-coded and stapled up the strips of printer paper. The result looks rather like a child's painting, but does reveal some Martian craters.

In the computer graphic technology section, two cases show graphic input and output devices. Rare items include the Rand Tablet and the crystal globe from MIT's "Kludge" terminal—one of the first geometric input devices. A video shows early graphics projects, from Ivan Sutherland's Sketchpad to the General Motors DAC-1, one of the first uses of computers in industrial design.

Several exhibits use the fine view



Andrew Kristoffy, Research Assistant for the gallery, first took a picture of his face. Then after it is stored in the computer, he can color each grey level differently to achieve an "Andy Warhol" look or begin to understand coloring of grey levels in order to bring out particular aspects of any image.



Associate Director and Curator of The Computer Museum, Dr. Oliver B.R. Strimpel, and Harvard University professor, Dr. Benoit B. Mandelbrot, also an IBM Fellow at the Thomas J. Watson Research Center, are shown standing with "Fractal Planetrise," an artificial computer generated landscape in "The Computer and the Image," a major gallery at The Computer Museum. Fractals are mathematical objects developed by Dr. Mandelbrot and have been used as models of natural phenomena such as turbulent fluid flow and the shapes of rivers and coastlines. Fractals have recently played a role in the synthesis of artificial landscapes for the film industry.

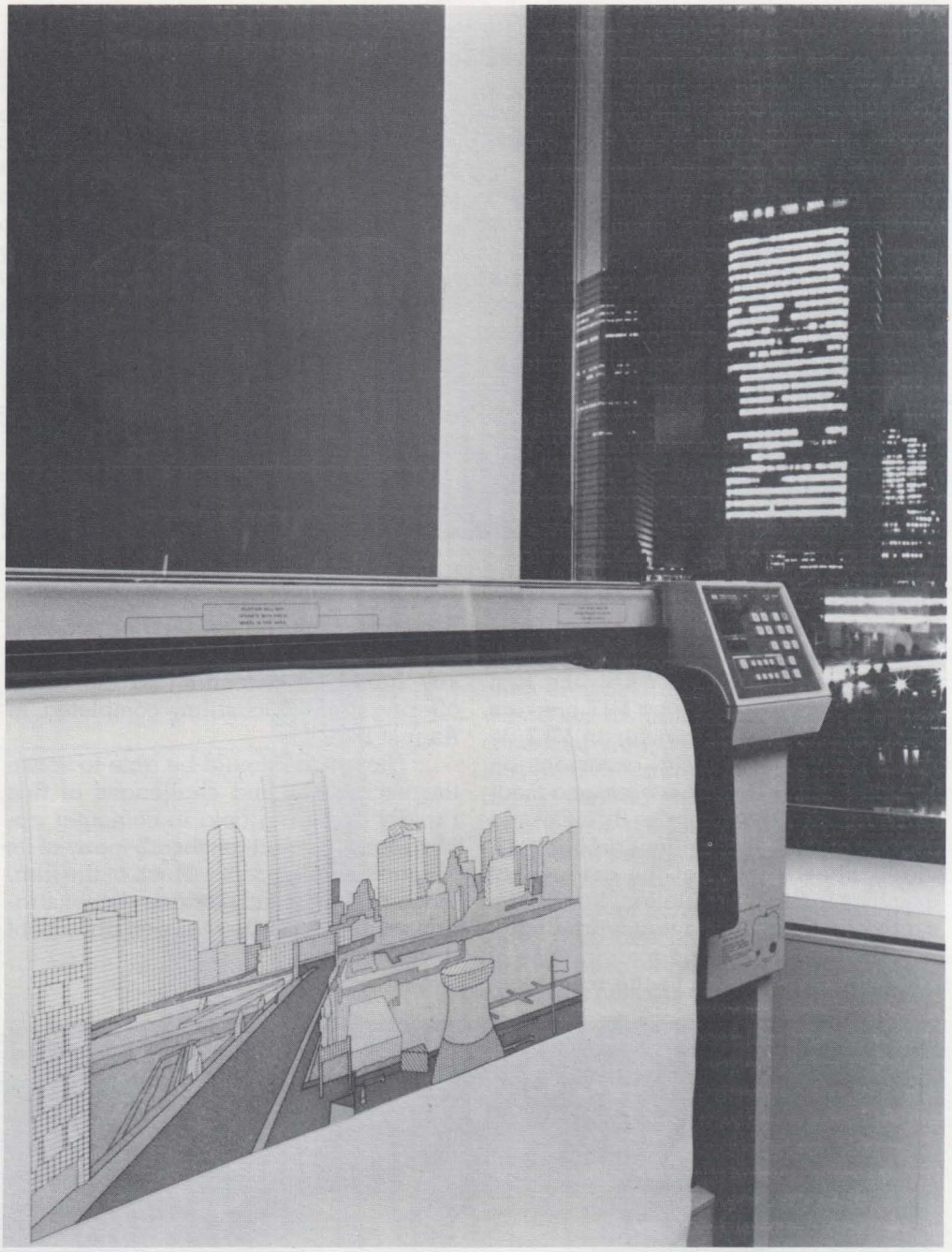
of downtown Boston from the gallery window as a starting point: a television camera captures an image for the visitor to color in digitally, a plotter continuously draws differently colored and shaded views, and a video shows both a walk through a 3-dimensional database of the city as well as an exhilarating range of special effects applied to stretch a 2-dimensional version of the view into "2½" dimensions.

The techniques of realistic image synthesis are shown in the section, Building an Image. Lighting, subtle color shading, the simulation of texture, transparency, reflections, and refractions of light are all shown. For many years, researchers in computer graphic realism used the data set that graphically reproduced Martin Newell's teapot to test their methods. The original teapot is now on show here in a mini stage set, next to a computer generated rendering of itself, complete with artificial colored lights. Here too you can browse through 3-dimensional computer models of houses on offer by a commercial builder.

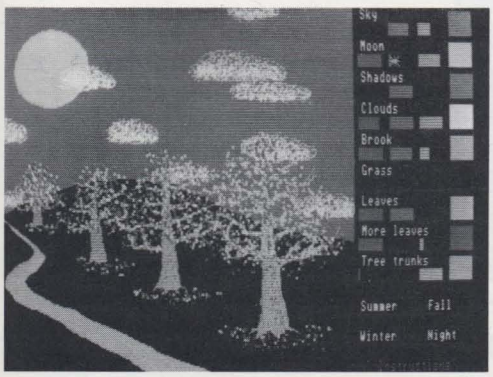
A section on computer-aided design shows images and objects designed with the help of a machine. Examples range from parts of a Boeing 757 to an Olympic running shoe. At interactive stations visitors can design a car and complete the design of an electrical circuit. A large high precision pen plotter draws the artwork required to fabricate a microprocessor chip.

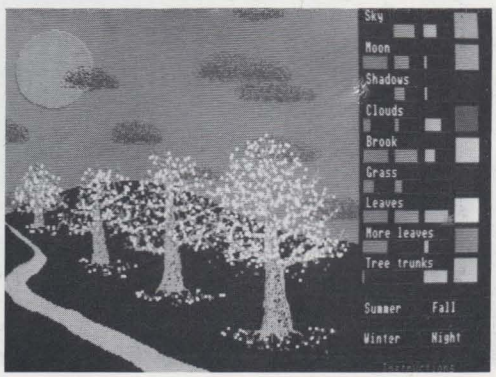
Interactive demonstrations allow the visitor to make his/her own fractals and cellular automata. Both are useful models of some natural phenomena, and rely on computer graphics for their investigation. Fractals are useful in generating artifical landscapes, several of which are shown here.

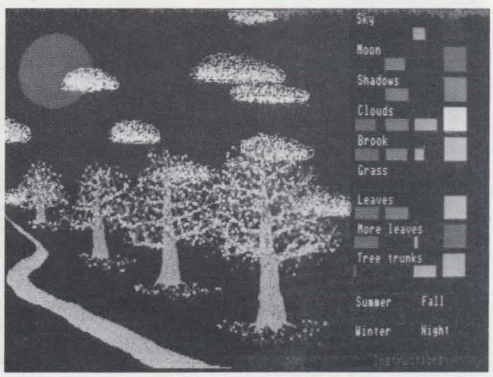
Pen plotter drawing the view from the gallery window programmed by Geoffrey Dutton for the HP 7586B connected to the VAX 750. The color and hatching denote properties such as distance, height and type of object, and are varied between one plot and the next. The drawing consists of 185 polygons which were digitized by tracing over a photograph.



Color by Numbers! Using a mouse, the visitor can instantly re-color this landscape, selecting the season and then mixing the paint (the proportions of red, blue, and yellow) desired for each of the objects.





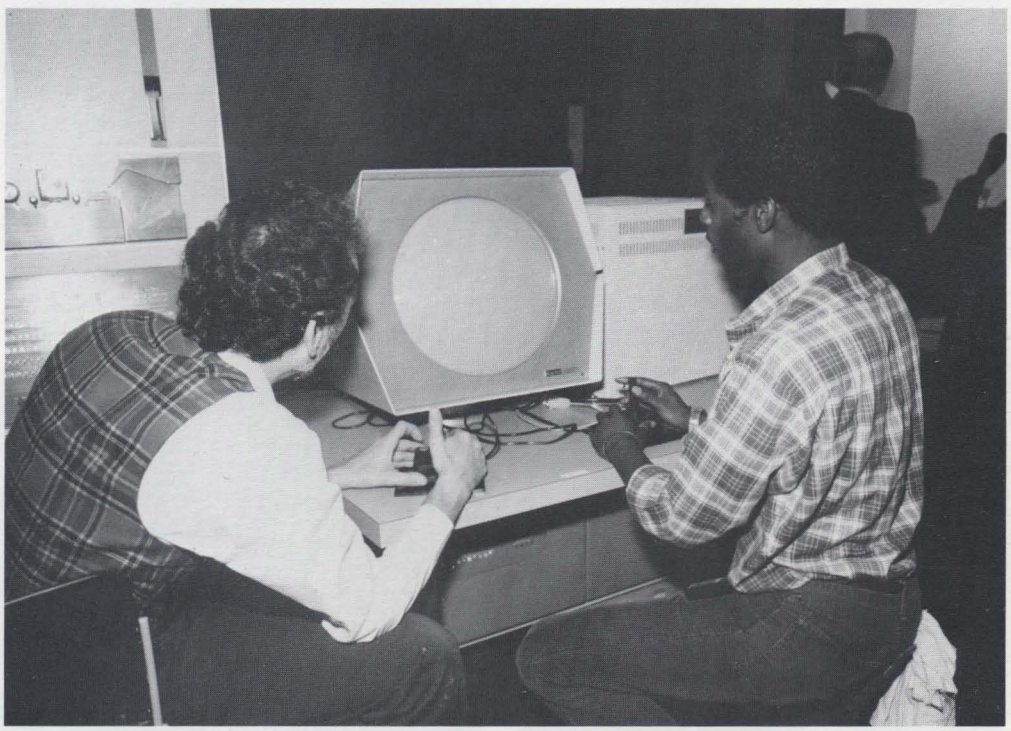


Eiji Kuge of NEC uses the NEC PC to simulate a pantograph. A signed nineteenth century pantograph provides the backdrop for a contemporary model that allows the visitor to understand how this drawing instrument works. Then, the scale of the same drawing can be rapidly changed using the personal computer.

In a section entitled Simulation, a video shows examples from the modelling of galaxy collisions to the interaction of a DNA molecule with a drug. The fantasy world of SPACEWAR!, the first computer game written by MIT hackers on the DEC PDP-1 computer in 1962, is demonstrated on special occasions on the PDP-1, and otherwise runs on a modern micro. Visitors can also fly a Cessna using a flight simulation program. A video shows state-of-the-art use of graphics in flight simulation, landscape synthesis, education and advertising.

Perhaps the most appealing use of computer graphics is in the making of films, both for animation and for the creation of convincing fictitious scenes. A computer animation theater shows a series of films from the earliest use of key frame inbetweening to the latest offering from Lucasfilm, completed in August 1984.

The visitor should be able to sense the excitement and challenges of this rapidly changing field in computer applications, as well as absorb many of its fundamental concepts. Much of the film, video material and working demonstrations will be updated to keep abreast of developments.



Martin "Shag" Graetz, who with Stanley Schultz and John McKenzie got the PDP-1 up and running with SpaceWar!, *plays a game with a novice.*