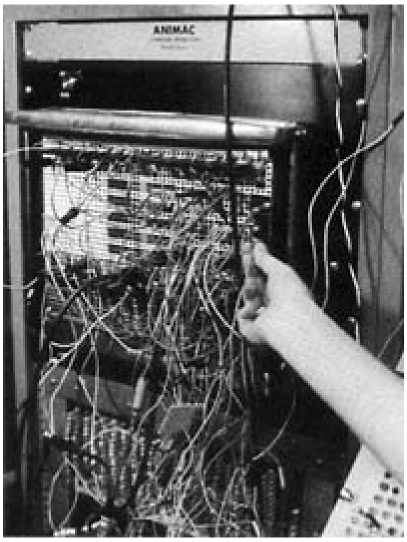
ANIMAC (Hybrid graphic animation computer), 1962
LEE HARRISON III


Lee Harrison III (right) receiving the National Academy of Television Arts and Science award for "Outstanding Achievement in Engineering Development," 1972, with his colleague Edwin J. Tajchman (left), V.P. of Engineering at Computer Image Corporation, Denver, Colorado.



ANIMAC


Lee Harrison III, photo montage featuring a dancer with body mounted sensors controlling real-time animation on the ANIMAC, 1962, Denver.

ON A RECOMMENDATION from Judson Rosebush, Steina and I dropped in on Lee last January. I quickly realized that I knew of Harrison from twenty years ago when Harrison and Rutt/Etra had a patent dispute, a time when everybodys name came up.

I must admit, I was quite taken by Lee's original approach to the stick figure animation. Now I find it simply irresistible. I had to return with David Dunn a month later and we really took him to the cleaners, collecting a number of rare items, from early sixties articles and photos, to a boxful of films.

In my search for the oldest I could find, I stumbled over the film of the ANIMAC, the first and the only machine of its name. "And where is the machine?" we asked eagerly. "On the dump" came the reply!

Once more we realized how hostile the industrial environment could be to a unique machine like this. How many fabulous designs are being destroyed daily just for a few cubic feet of space or the vanity of an engineer promoting his new brood. Of course Lee knew that. "They finally talked me into it!" he said sadly.

Besides the stick figure, well-researched, described and conceptualized in a series of patent papers, Lee must have been responsible for a series of sonar analyzing films: very beautiful sets of matrices of vector sticks and expanding/contracting circles, each operating in a different frequency spectrum.

Lee is the true pioneer, clearly predating all the efforts of the legitimate avantgarde. Although his thinking and lifestyle did not belong to the contemporary art scene of the sixties, his work in its concept was visionary and aesthetic. Obviously he follows a long tradition of the maveric legendary inventors, working out of their basement or garage. I can see no way in which his project could have succeeded in its totality. I think it was the sudden success of his company which shelved his dream while the rapidly changing technology took away his concept of human figure animation, certainly unique and original. Even as an oddity, it shines in the dawn of the computer age.

W.V.

BORN 1929 in St. Louis, Missouri. Studied at the School of Fine Arts, Washington University, St. Louis. 1953 U. S. Coast Guard Officer Training, New London, Connecticut: stationed in Long Beach, California, and the Philippines. 1955 Technical illustrator, McDonald Aircraft, St. Louis. 1956-59 Engineering School, Washington University, St. Louis. 1959-65 Engineer at Philco Corporation, Philadelphia. 1965 Bio-cybernetic Engineer at the Denver Research Institute, University of Denver. 1967-68 President, Chairman of the Board, & CEO of Lee Harrison Associates. 1969 Founder & CEO of Computer Imaging Corporation. 1971 President until it closes. Lives in Denver, Colorado.

"WE STARTED OUT by developing what later became ANIMAC. At first we called our machine "The Bone Generator" because it made sections of straight lines that could be hooked together and could be individually animated or moved in three-dimensional space. To determine what a bone was you had to determine where it was to start in X, Y, Z space, in which direction it went from there, and for how long, in order to determine its length. The parameters that determined which direction it was going in also determined the actual length projected onto the face of the tube. If you saw a bone from the side you saw its full length but if it were pointing toward you, you saw only a portion of it. A bone was composed of a bistable multi-vibrator or a flip-flop. To start it was to essentially put a signal on a line that governed the opening of a lot of sampling gates. The inputs to the gates were the parameters that governed the position and some of the qualities and characteristics of that bone. To program it we had a patch panel.

We always had a navel point on our figures and we'd always flip back to the navel point. We'd go up and out an arm and go back to the navel point, go up and out another arm and back to the navel, go up and out to the head. Those were all fly-back bones and we would fly-back by just collapsing the information that was contained on a capacitor.

In order to determine the length of a bone we used time as the basis. We'd start drawing in a certain direction determined by the specific parameters and we'd go in that direction until we'd turned that bone off and then essentially we'd wait there until we drew another bone. The length was determined by plugging a timing circuit into a place which was reset after each bone. When you started a bone you also started that counter and that flip-flop was plugged into the counter that would turn that bone off. It was pretty much all digital. The next bone would be plugged into another count and so forth and you varied the counts depending. A count represented some number of high frequency units that was part of the clock network of the whole machine.

The patch panel was color-coded and it was a big patch panel we got out of the junkyard someplace. If you understood the code you could actually see the bones on this patch panel. There would be a certain color like green and the output might be a blue. If you were going to bone number one, you brought a start pulse that was located somewhere and you'd plug into the first bone and then you'd plug from the output of the first bone into the second bone and so forth. The inputs to the parameter gates were not located on that panel. They were located down a little lower on the face of the Animac and there were hundreds of them. You had all of these hundreds of inputs required to make the thing happen and to change it over time. After this, the main thrust of our development was to make things change over time which eventually culminated in what we called key frame programming where we would turn knobs until we got what we wanted."

L.H. 3/2/92

EARLY SCAN PROCESSORS ANIMAC/SCANIMATE

With ideas predating 1962, Lee Harrison III had the dream of creating animated figures. His idea was to view a stick figure as a collection of lines that could be independently moved and positioned to form an animated character. The figure would be displayed on a Cathode Ray Tube (CRT) and be electronically generated and controlled through vector deflection of an electron beam. Each figure was composed of bones, skin, joints, wrinkles, eyes, and moving lips, all drawn in sequence to create a "cathode ray marionette". The idea evolved into a hardware contraption called ANIMAC which could perform "big animation." ANIMAC was developed in the early 1960's by Lee Harrison and Associates in Pennsylvania.

ANIMAC's basic character starts out as a stick figure, with each stick called a "bone," made from wire-frame line segments. A "skin" is added to the bones by superimposing curlicue springs that modulate the stick vectors with circular sweeps of spinning vectors. The thickness of the bones, or displacement of the rings from the center of the line, is voltage modulated by a "skin scanner." The scanner is constructed from a "flying spot scanner," a vector camera pointing at an intensity graph with higher brightness representing a larger bone displacement.

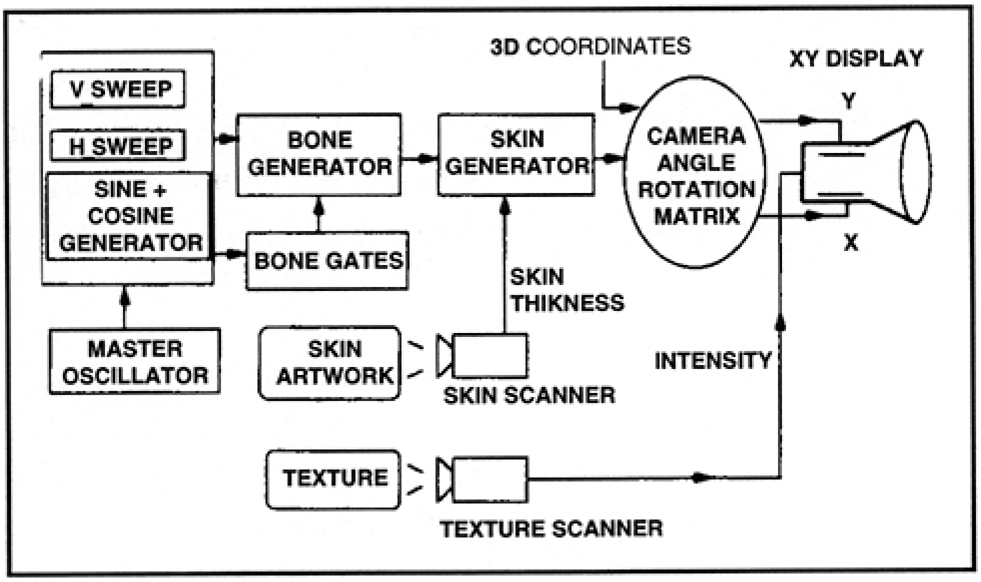
The "joints" or connection of bones to skin are formed by drawing the bones in a specified order, the endpoints being momentarily held till the next bone is drawn. A synthetic mouth, lips and eyeballs are created through parabolas and sine waves modulated with precise control from voltage sources. The entire figure is manipulated in three dimensions by passing the control signals through a three-dimensional (3D) rotation matrix. These control signals are formed from horizontal and vertical sweep generators, with camera angle, size and position voltages run through rotation matrices constructed from adders, multipliers and sine/ cosine generators.

To give the illusion of depth, an additional camera tracks the intensity of the skin, giving the illusion of an edge by modulating the skin brightness and leaving it in silhouette. This same camera can scan a texture and superimpose it on the skin surface of the bone.

The ANIMAC was largely a proof of concept prototyped with vacuum tubes mounted on 2 by 4's, using a Heathkit oscillator as the master clock and driving an XY oscilloscope for the display. Most of the results are documented in film, with a film camera pointed at the XY display. Multiple passes with Red, Green and Blue filters, were used to create color figures. Numerous experimental input voltage sources were tried, from knobs to joysticks to an "animation harness". The harness was fabricated from potentiometers and Lincoln Logs used as armatures. Manipulating the harness tied tactile movement into control voltages, making the character "dance."

In the late 1960's ANIMAC was converted into a transistorized version and numerous patents granted for it's underlying processes. To commercialize on the scan processing experiments, the animated cute springy character transformed itself into a means for moving logos and high contrast graphics about the screen. The curlicue skin is "unraveled" and becomes small movable rasters called "flags." The Skin Scanner is modified, and now points at the "Artwork" of a logo or corporate graphic. The intensity of the scanned image fills the undulating flag and is flown and spun across the surface of the screen. The multiple bone mechanism is simplified into five flag generators. The XY display is now rescanned by a video camera with 5 levels of colorization and combined with a background graphic for recording on video tape. These modifications combined with it's new commercial function, were named in 1969: SCANIMATE. The company went public and was renamed Computer Image Corporation.

Jeff Schier


3D COORDINATES
XY DISPLAY
V SWEEP
H SWEEP
SINE + COSINE GENERATOR
BONE GENERATOR
SKIN GENERATOR
CAMERA ANGLE ROTATION MATRIX
Y
X
BONE GATES
SKIN THIKNESS
MASTER OSCILLATOR
SKIN ARTWORK
SKIN SCANNER
INTENSITY
TEXTURE
TEXTURE SCANNER