More than 30,000 people mobbed the Anaheim, California, Convention Center to attend SIGGRAPH 87 from Sunday the 26th of July through Friday the 31st.

More than 4,200 attended courses, while 3,900 went to technical sessions ranging in difficulty from beginning to advanced. There were 271 lively exhibitions on the exhibits floor.

Courses were offered ranging from the Fundamentals and Overview of Computer Graphics (chaired by Olin Lathrop of Apollo and taught by Norman Badler of the University of Pennsylvania; Richard Fichera, a consultant; and Carl Machover of Machover Associates) to the Making of the Mechanical Universe (both chaired and taught by Jim Blinn, of Jet Propulsion Lab and CalTech, who created that critically acclaimed television series done in computer graphics).

Exhibition
The exhibition floor seemed even busier this year than it has been in past years. It has always been a jungle of people standing in the aisles watching various exhibitors’ wares being demonstrated. This year, however, there seemed to be more exhibitors than usual attracting such traffic-stopping crowds.

Technical sessions
Those who attended technical sessions heard papers presented on such subjects as Animation, Ray Tracing, Graphics Systems, Texturing and Shadowing, and Lighting Models.

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Selective Update

Film and video show wows' em in Anaheim

For two hours on Tuesday, Wednesday, and Thursday evenings in Anaheim, July 28-30, "the magic kingdom" may well have been across the street from Disneyland in the Anaheim Convention Center's Arena. SIGGRAPH's Film and Video Show extravaganza combined liberal servings of imagination and technical prowess in what may have been the hottest of the many entertainments offered in this mecca of tourism. At least an appreciative—if somewhat specialized—audience certainly thought so.

This proximity of Disneyland and the SIGGRAPH Film and Video Show, one symbolizing early pioneering achievements in the animators' art and the other displaying the latest high-tech enhancements, seemed an appropriate juxtaposition. And what better way to appreciate the evolution of animation from paint brush to electronic palette than to find that one of the more popular selections in the show was from Walt Disney Pictures?

It isn't easy to tell a story in a minute or two of animation, but those that made the effort enjoyed an enthusiastic reception. In addition to Disney's story of two junk-yard dogs and their encounter with a gigantic steam shovel, the audience saw Toyo Links Corporation's Peppy the pineapple entertain on his ukulele while remaining oblivious to such distractions as a rapidly rising ocean tide.

Symbolics Graphics Division and Whitney/Demos Productions presented a visually rich and colorful story about the mutual attraction of a bird and a fish and the dramatic breakthrough that brings them together. Probably most affecting was Pixar's Red's Dream, the fantasy of a lonely unicycle imagining a few brief moments of glory in the spotlight of a circus act. Creator John Lasseter, whose credits include the widely acclaimed Luxo Jr., is proving that computer-generated animation is not necessarily a cold and dispassionate technical achievement but can be a versatile means for portraying a wide range of human emotions.

Other crowd-pleasers included Yoichiro Kawaguchi's highly individual Ecology II: Float from Nippon Electronics College, and Jim Blinn's The Quantum Mechanical Universe, an instructive and somewhat laid-back look at elementary concepts of quantum mechanics.

Many of the selections shown fell into the corporate communications or advertising category, where clients are not afraid to spend large sums to achieve just the right image. Science and industry, research, and broadcast also represented the "practical" side of graphics animation as opposed to the more whimsical pursuits of music visualization, fine art, and theatrical motion pictures.

A couple of interesting examples of human figure articulation in the form of dancers demonstrated the current state of this particular art. Old-fashioned pen and paint-brush animators may take some comfort in the present limitations of the computer to generate realistic human motion, but younger artists might think twice before planning a long career in this field. Just as AI researchers continue to zero-in on the way we think, computer graphics animators are learning more and more about the way we move—and how to duplicate it. For the time being, however, the Screen Actors Guild needn't worry that its members are in danger of being replaced by digitized clones... just yet.

Traditional animators talk about computer animation at SIGGRAPH panel

The SIGGRAPH panel entitled Traditions and the Future of Character Animation turned out to be a lively discussion of whether or not computers have a legitimate place in animation.

John Lasseter of Pixar, the panel chair and a former Disney animator, said in his introduction that the purpose of the panel was "to have a lot of fun" and see cartoons, and the audience was treated to some good clips of traditional animation, including some European work offered by Alex Carola, director of the Graphouli Studio in Brussels.

Early in the session, however, the traditional animators' resistance to computers became evident. Glen Keane, a Disney animator, said, "I love to draw—I'll kill any man who tries to take a pencil out of my hand. With a good leaded pencil," he continued, "there is a tactile feeling to drawing." Pointing out that an animated feature takes three years to produce, Keane said, "You've got to have a lot of love to put out the energy that this requires. You computer people who are moving into animation should remember that."

Frank Thomas, a directing animator at Disney, was a bit more conciliatory. He said that animation by either computer or hand drawing was hard, sometimes tedious work. What should be kept in mind is that these are two different forms of animation: "Computer animation shouldn't try to do what an artist with a pencil can do." A definite good that has arisen from computers in animation, Thomas said, is that computers allow people who cannot draw to make a film.

Thomas also made a critical
University. Greenberg was honored as both a pioneer of original ideas and a teacher of these ideas to numerous students. Beginning as an architect, he went on to explore computer graphics with students even when it took them geographically far afield just to find a computer that could serve their purposes. Since then he has concentrated on the scientific principles necessary for realistic image synthesis, concentrating on light reflection, image rendering techniques, global illumination algorithms, and ray tracing and radiosity. He has published more than 100 articles, founded Cornell’s Computer Aided Design Instructional Facility, and is now working on a supercomputer facility at Cornell.

**Achievement award**

A Greenberg student, Robert L. Cook, won this year’s Computer Graphics Achievement Award. Cook has published papers on synthetic texturing, reflectance models, and shade trees. His software has been

remark about computer animation, which drew applause from the audience. He said that in computer animation there has been too much emphasis on attaining realism. “There is,” he said, “a whole different world out there.”

In the period set aside for reactions from the audience, Keane, in response to a comment, speculated about why some traditional animators are drawn to computers. He said that he has seen two kinds of animation artists: those who love to draw, and those who like to draw but always wish their drawings could be slightly better or more polished than the drawings they are turning out. The second kind of artist may come to see the computer as a way to achieve greater polish.

Lasseter, who animated last year’s Disneyesque SIGGRAPH hit *Luxo Jr.* and this year’s *Red’s Dream*, said that drawing is dear to him, and he is hoping to find a way to bring more of it into computer animation.

But Brad Bird, a freelance animation director who animated the “Family Dog” for *Amazing Stories*, made a comment that did not bode well for computers in character animation. “A great animator,” he said, “knows how to cheat to make a thing come off. This has nothing to do with logic or anatomy, and the biggest computer couldn’t do it.”

The panel ended with the animators agreeing that computers could be useful in some aspects of animation. Nearly all the participants thought that computers may turn out to be the best way to make backgrounds, enabling quick and frequent perspective changes and different light sources and textures.

The traditional animators also said they would be interested in a scanner that could capture their drawings better than the cameras now used, and perhaps in technology that could smooth and taper their hand-drawn lines, once the drawings were captured.
used to render such well-known animation strips as The Adventures of Andre and Wally B and Luxo Jr. As part of his research Cook developed stochastic sampling, a method for antialiasing point sampling algorithms, which also solved the highlight aliasing problem. He extended this to distributed ray tracing, an algorithm that solved several problems in image synthesis.

**Fast Start**

Activities at SIGGRAPH 87 took a running start on Sunday afternoon as several hundred people turned out for the three-hour fundamentals seminar conducted by Richard L. Phillips of Los Alamos National Laboratory. This wide-ranging survey of computer graphics equipment and applications was intended for an audience without any technical background whatsoever. The high level of interest in the seminar (held two days before the official opening of the entire conference) indicated that many people are continuing to enter the field as computer graphics expands to encompass an ever-increasing

**Jim Blinn and the Mechanical Universe**

A highlight of SIGGRAPH 87 was the course on the making of the *Mechanical Universe*. Taking a novel approach to the subject, Jim Blinn lectured to an audience of well over 500 people for a full day on the lessons he learned while making the *Mechanical Universe*. He said he learned much more than he had known before about use of screens and animation. Coming from Blinn that seems unlikely, but he regaled his audience with all the things he had done, then learned there was a better way.

For example, he noted that the fonts used, particularly for math, are vitally important. The wrong font can make the work anything from difficult to impossible to read.

About colors he revealed that it is easy to get carried away and put too many colors on the screen at once, making the picture frenetic and very difficult to follow. He also advised using the same color for any element all the way through a work. It should not reappear with a different color. That way the color serves the very utilitarian purpose of becoming an identifier.

While you need schematics, Blinn said, they should be identified as such. Otherwise people will take them too literally.

An interesting lesson Blinn told about was the discovery that your perception of velocity is not as sharp as your perception of size differences. He illustrated by running boxes across the screen at slow and fast speeds. Indeed the different velocities were almost indistinguishable, even though the audience was told which was which. So you must enhance different velocities to make them show up.

Blinn shared a simple technique for making figures walk. You make four feet rotated around a hub. Then place the hub so only two feet appear to be on the ground. The two uppermost feet are hidden behind the figure's clothing, so when you rotate the hub, the two feet that show at any one time appear to be walking. Ingenious little trick!

Timing is of great importance and takes some objectivity to see. You must be careful not to go too fast with informational animation. But in doing so there is a danger of slowing down so much you get boring.

While color is a nice enhancement for conventional analysis, Blinn said, you must be careful not to overdo it. For one thing, many people may see the work on a black-and-white screen. There are also color blind people to consider.

The entire day's lecture went on with marvelous insights garnered from the seven years of work it took to make the *Mechanical Universe*—the outstanding course in physics that now plays on Public Television stations.

A coursebook on the class is available from SIGGRAPH at 11 West 42nd St., New York, NY 11036.
number of application areas.

In a presentation that made liberal use of slides and videotape, Phillips, who has been active in computer graphics for almost 20 years, covered basic hardware and software terminology, compared alternative display technologies, and provided a glimpse of the diverse application areas. At the end of the session he offered a thumbnail sketch of what attendees could expect to see at SIGGRAPH and recommended ways to get the most from the exhibition. Overall, the seminar provided a much-needed point of departure for newcomers who might otherwise have been overwhelmed by the magnitude of the conference offerings.

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Industrial designers cite need for more flexible tools

"Future archaeologists will judge us more by our Buick Roadmasters and our Sunbeam toasters than by what's in our museums," said Del Coates, moderator for the SIGGRAPH panel on Computer-Aided Industrial Design: The New Frontiers.

Such a claim effectively turns a spotlight on what Coates, of San Jose State University, calls "an invisible profession." And while industrial designers have a greater influence on our lives than architects, Coates says, the CAD market nevertheless caters to the architect.

Panelist Fred Polito of frogdesign noted that designers quickly reach the limits of their computer design equipment. To a designer, trying to use a CAD system is like trying to draw a circle on a child's Etch-a-Sketch toy, he added. Polito feels that the software is not written to handle edges properly and that the focus is on primary surfaces instead, forcing designers to work backwards.

"The concept is a fleeting moment in the design life of a product," said Bruce Claxton of Motorola Corpora-
tion. "CAD systems are too slow. A sketch is better for spontaneity." He would like to see software that is more intuitive and user friendly. Furthermore, he finds that the designers' images are still limited in their ability to "talk to" engineers.

Polito described the designer's problem by means of an analogy to glass blowing, where the craftsman designs the piece without being able to touch it. "A designer needs computer tools that are extensions of his hands," he explained.

David Royer of Ford Motor Company would like to be able to do everything "on one tube." It would help if designs done on a paint system for presentation purposes could be transferred directly into a CAD system, he noted. Not content to wait until the market meets its needs, Ford is working with Evans & Sutherland to create a designer-oriented workstation.

The Friday morning panel session, which drew a good crowd and elicited numerous questions, didn't focus on just the shortcomings of current design systems. Many positive comments were offered on the advantages of CAD tools. For example, Fred Polito noted that frogdesign's clients are often shown only computer images and do not need sketches on which to base their decisions. Claxton observed that the ability to evaluate new designs is no longer limited by a designer's drawing ability. And, of course, some designs are quicker on computers. Although models are still used, particularly in automotive design, CAD has nevertheless eliminated many generations of model making.

There appears to be a great deal of room for enhanced workstations and more flexible software. Better texture mapping, greater accuracy in specular reflection, faster shaded images and paint systems, and more intuitive interfaces are high on the priority list for designers. It remains to be seen how the market will respond to these needs. Surely as the technology matures, industrial designers will find an ever-widening array of tools at their disposal.
Public review and comment period for PHIGS and PHIGS+

X3, the Accredited Standards Committee on Information Processing Systems, has announced a third two-month public review and comment period on draft proposed American National Standard X3.144-198x, extending through September 30, 1987.

In related activities, the PHIGS+ ad hoc working group has released for review a specification for a group of proposed extensions to the Programmer’s Hierarchical Interactive Graphics System. The PHIGS+ enhancements cover such areas as lighting, shading, depth cueing, and advanced primitives not addressed in the current draft proposed PHIGS standard.

Advanced applications typically call for such rendering effects as Gouraud and Phong lighting and shading. The PHIGS+ specification extends PHIGS by adding geometric information, such as vertex normals, to primitives. The specification also adds attributes such as direct color, surface properties, and light sources. Proposed primitives include quadrilateral meshes, triangle strips, and nonuniform rational B-spline curves and surfaces.

At least 11 of the 20 organizations that participated in formulating the PHIGS+ specification are also participating in the official PHIGS standards efforts. A revised final specification ultimately will be submitted to the appropriate ANSI and ISO committees for consideration.

Copies of the Programmer’s Hierarchical Interactive Graphics System draft standard can be obtained from Global Engineering Documents, Inc., by calling (800) 854-7179 on the West Coast or (800) 248-0084 on the East Coast. The single-copy price is $75.

Copies of the PHIGS+ specification are available by writing to the ACM SIGGRAPH Conference Management Office, 111 East Wacker Dr., Suite 600, Chicago, IL 60601. Requests must be accompanied by a $15 check drawn on a US bank, payable to ACM SIGGRAPH. Comments are requested by October 1, 1987.

Program focuses on computer careers for physically disabled

Lift, Inc., a nonprofit corporation active in the field of computer programming careers for telecomuters with severe physical disabilities, has announced two new program offerings: careers for CAD/CAM specialists with mobility disabilities and for on-site programmers with visual impairments.

The program steps include recruitment, evaluation, and selection of candidates; six months of formal education; employment by Lift for an on-the-job trial period; and direct employment by the corporate client.

For further information contact Lift, Inc., 350 Pfingsten Rd., Suite 103, Northbrook, IL 60062; (312) 564-9005.

Image transfer demonstrates progress in connectivity

A Zenographics image has been transferred to a Genigraphics workstation and back again using Zenographics’ Metafile utility based on the ANSI Computer Graphics Metafile standard. The demonstration was conducted by the New York City chapter of NCGA.

The presentation consisted of an IBM PC XT running Zenographics’ Mirage presentation graphics software with the Metafile utility. The PC, along with a Genigraphics SG-2 graphics workstation, was hard-wired to a MicroVAX II equipped with Genigraphics’ Data Collector software.

A logo was created on the XT using Mirage software. The Metafile utility allowed the Zenographics IMA image to be saved as a CGM file. This file was then uploaded via Kermit communications software to the MicroVAX II, where the Data Collector software converted it into Genigraphics art files for display on the SG-2 workstation. Later, the image was sent back through the MicroVAX II and into the XT, where Metafile converted the CGM image back into a Zenographics IMA file.

Zenographics reports that the showing, stressing two-way connectivity between competing graphics systems, took place before approximately 80 graphics professionals and analysts.
CGM vendors and implementations to be tracked

A database of vendors and implementations of products using the International Standard Computer Graphics Metafile (CGM) is to be maintained by members of the American National Standards Institute’s Accredited Standards Committee X3H3 on computer graphics.


Before the acceptance of CGM as an international standard, transfer of computer graphics picture description information between computer vendors often required translator software to accommodate the differences between systems. CGM can be used as a common format for interchanging computer graphics picture description information between dissimilar systems.

The CGM is a device-, installation-, and system-independent computer graphics data format used by many graphics systems and applications. The CGM standard allows graphics data to be archived in a digital format or transferred between computer graphics devices and installations. The standard is said to aid computer graphics software implementors in understanding and using graphics data storage methods. In addition, CGM guides device manufacturers on useful computer graphics capabilities.

Potential users or vendors of CGM who are interested in the guide should contact John Casey, McDonnell Douglas Corporation, W316/101/CS/198, PO. Box 516, St. Louis, MO 63166.

IMI announces real-time hidden-surface algorithm

An “elegant” algorithm that produces edge-based hidden-surface removal in real time has been developed by Interactive Machines, Inc., a Calabasas, California, manufacturer of computer graphic systems for flight simulators, avionic displays, and high-end animation.

The algorithm is described by the company as a sophisticated sequence of mathematical formulas for solving the hidden-surface removal problem in real time without the need for any external computational power.

Developed by a research team at IMI headed by Walter Gish, chief scientist, the algorithm is said to represent a whole new way of thinking about computer graphics.

“Solving this problem required elements of topology, computational geometry, and numerical analysis,” Gish said.

“This new approach,” he continued, “eliminates the long-standing brute force methods of hidden-surface removal that resulted in computational time increasing dramatically with the complexity of a picture. This algorithm actually becomes more efficient as the complexity of the object increases so that computational time for a complex object is little more than that for a simple object.”

IMI summarized the achievement by saying that, for the first time, a user can interactively manipulate a 3D object in real time in a self-contained, practical, and affordable system.

The algorithm is currently available as a standard feature on the IMI-600 line of high-performance computer graphic visual systems.

Hearing to consider copyrighting of screen displays

The Copyright Office, Library of Congress, will hold a public hearing September 9 concerning the registration and deposit of computer screen displays. The key issues are whether the office should register any screen displays separately from the underlying programs that generate them, and what the office should require as the deposit if any registration is made for screen displays, either separately or as part of a program.

Following several recent court decisions concerning video games, the Copyright Office has registered pictorial and graphic screen displays as audiovisual works, independent of the program generating them. However, the office does not register separately textual screen displays, reasoning that there is no authorship in ideas or in the format or arrangement of text, and that any literary authorship in the screen display is covered by the underlying program, which is recognized as a literary work.

The hearing will be held at 9:30 a.m. in the Mumford Room of the James Madison Memorial Building, LM-649, sixth floor, Library of Congress, First and Independence Ave. S.E., Washington, DC.

Although the deadline is past for those wishing to testify, anyone wishing to present written comments can submit their remarks (10 copies) on or before October 9. These should be mailed to the Library of Congress, Department 100, Washington, DC 20540. Comments can also be delivered by hand to the Office of the General Counsel, Copyright Office, James Madison Memorial Building, Room 407, First and Independence Ave. S.E., Washington, DC.

For further information contact Dorothy Schrader, General Counsel, Copyright Office, Library of Congress, Washington, DC 20559; (202) 287-8380.