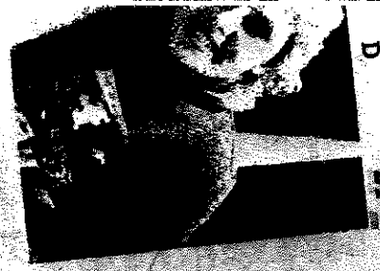

Coming Impact of Technology on the Arts
Computer Violins and the Electronic Palette

By ALEXIS GREENE

New technology is bringing the arts into the 21st century. Computers, once thought to be the enemy of all things creative, are being discovered as tools for composers, painters and choreographers. Television, once looked down on by people in the arts, is becoming seen as a means of rescuing financially strapped arts organizations. At Stanford University, there's a musical instrument that can imitate the sounds of an entire symphony orchestra. Boston technicians and artists are collaborating to create radically new holographic scenic effects for a forthcoming production of Berlioz' "Damnation of Faust." In the years ahead, modern technology is likely to have a profound effect on music, dance, theater and the visual arts in ways that can only be guessed at in 1978.

Let's start with the field of music. Composers of "computer music" say that within the next 10 years the concert-goer will see a new instrument on stage among the violins and cellos and French horns. This will be about the size of an organ, and its keyboard will be a cross between that of an organ and a computer terminal. Laboratory-sized versions of this instrument are already in existence: in Paris, for example, where Pierre Boulez, the former conductor of the New York Philharmonic, now directs an organization devoted to studying the use of computers in music; at Stanford University, where composer John Chowning heads the Center for Computer Research in Music and Acoustics. Professor Chowning oversees equipment at Stanford that can produce the sound of any orchestral instrument—as well as many sounds no one has ever heard before. Mr. Chowning's instrument can produce the sound of 18 violins, or a sound halfway between a vocal tone and a drum; it can seemingly change the acoustical qualities of the room one is sitting in; it can make the room seem to expand or contract and, says Mr. Chowning, it can produce sounds that seem to move in space, one minute emanating from some point inside a hall, the next second coming from some place far beyond the hall. If desired, all this at speeds that no human performer could possibly match.

The Stanford equipment won't travel, but at the Bell Laboratories in New Jersey there's a new computer-instrument that can be transported. Although designed as a communications research tool for the Bell System, this computer-controlled sound synthesizer can imitate up to 30 musical instruments and produce the sound of from five to 20 instruments playing together; it can play 100 notes per second, with precision; it can generate musical sounds never heard before. This instrument is less powerful than its Stanford cousin, but it is self-contained (it takes up a mere 12 cubic feet of space). It has two five-octave, pressure-sensitive keyboards and from the front looks like an organ, except that above the keyboards are a typewriter-like computer terminal, a panel of sliding levers, and a small video screen for displaying notation.

Last October, Bell took the console to the Hollywood Palladium for a 50th anniversary celebration of talking pictures. Designer and builder Hal Alles says that as an orchestral instrument, this synthesizer is not quite ready to make its debut, but already a musician can sit at the keyboard and "conduct" a piece that has been programmed beforehand. By touching the keys and commanding sounds that resemble strings, brass and percussion, a musician can

Continued on Page 22

Alexis Greene is a freelance writer now at work on a book about television

The Coming Impact of Technology on the Arts

Continued from Page 1

orchestrate a composition while he plays it. He can also sing into a microphone, and, from his voice model, the instrument will reproduce a vocal range from basso to soprano. Mr. Alles predicts that within five years such synthesizers will be marketed commercially. Would this kind of system ever replace conventional instruments? Robert A. Moog, inventor of the Moog synthesizer, says "No," although he adds, "It's hard to know what musicians are going to wind up doing 50 years from now." Max V. Mathews, one of the country's foremost developers of computer music, says that computers will augment existing music with new timbres as well as new and different sounds.

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Computers have also found their way into the dance studio. Choreographer Mimi Garrard uses a computer to compose lighting patterns and bring about what she calls "a whole orchestra of dancers." Her small computer hooks into a lighting dimmer system; Miss Garrard sits at the computer keyboard and develops light designs while she watches her dancers rehearse. The final light plot becomes a score rather than a cue sheet. The result: audiences see lights undulating in opposition to each other, precisely crisscrossing patterns, and lights vibrating at speeds that no manually-operated system could achieve.

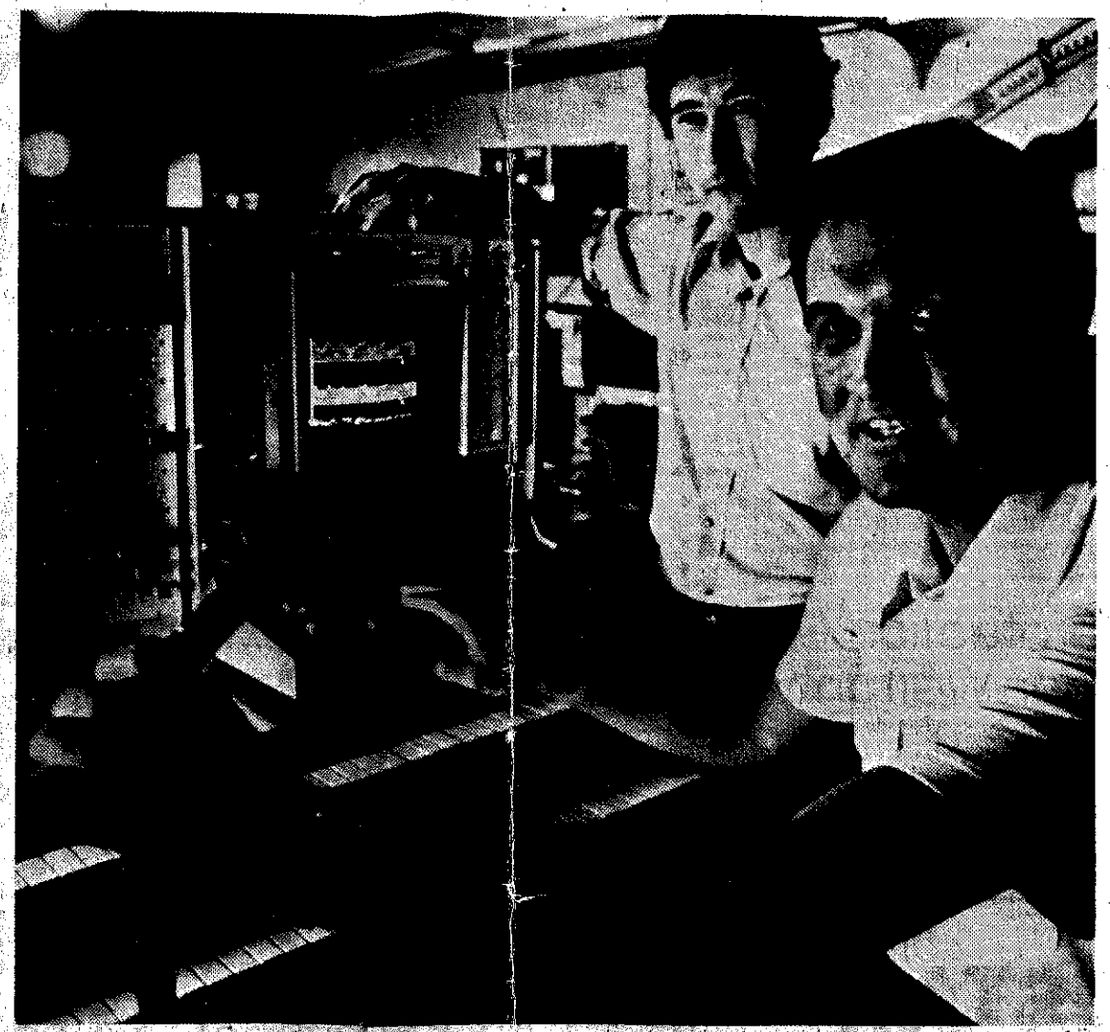
But no new technology has affected dance the way television has. Television's special effects have led choreographers to develop a new art form, which is being called videodance. Twyla Tharp uses slow motion to swirl costumes into a blur of color and superimposition that allows one dancer to seem to execute two opposing movements at the same time. Also video performers can appear to dance in mid air, free from gravity.

Sophisticated camera technology has enabled Lincoln Center to telecast ballet under performance conditions. New camera technology may soon enable the home viewer to see dance from vantage points that any balletomane might envy. Imagine the shots from a camera so small it could rest unobtrusively on a conductor's podium or disappear into a stage set. From Bell Labs comes a solid state TV camera that measures 6 inches long and 2 inches square; Bell Labs scientists say they have produced a version half that size, and the cameras can become smaller still. Mark Schubin, [illegible] Lincoln Center's" engineer would have included an auditorium for film and video projections; smaller rooms for screenings and seminars; a square room for three-dimensional projections, with swivel chairs for viewing "surround" images; a library for visual electronics material; an exhibition area devoted to communications systems that involve the arts; and an information hall. Such a center, he believes, will come into existence somewhere at some point in the not-too-distant future.

In fact, museums may become telecommunications centers. At Goldmark Communications in Connecticut, they market a video playback system that stores up to 30 hours of programming on a one-hour videotape. The video pictures are primarily stills, which is one reason the late Peter Goldmark, who invented the long-playing record, thought the system would be especially appropriate for museums. Rapid Transmission Storage (RTS) could play back 30 hours of programming to 30 different TV monitors in 30 different galleries—or 30 different museums in 30 different cities, if the museums were connected by satellite. At a museum in Boston, a visitor could turn on a TV monitor and receive programming from a museum in Washington, D.C.

The future museum-goer may be able to "walk" through computer-simulations of ancient Rome or 19th-century London, much the way that airplane pilots in training "fly" into simulated airports. From the Evans and Sutherland Computer Corporation in Utah come "dynamic-simulation" programs that can alter a projected, computer-generated image 30 times a second. If a museum-goer were to sit in the middle of a room like the square one the Metropolitan was planning, and if swiftly changing, three-dimensional graphics were projected on the walls around him, he could feel as though he were "walking" through three-dimensional space. Conceivably, the viewer could press a lever on the arm of his chair and take a stroll from one end of ancient Rome to the other.

An odd footnote to the story of video art: at the forefront of the art and technology movement of the late 1960's and early 1970's, video art now seems to find itself waiting for the technology of the home media center in order to flourish again, according to those involved with the art. Howard Wise, who in 1969 mounted the first major New York gallery show for video artists, says that the predicted surge in the home video market will prove a boon to the video artist, who suffers from the lack of private buyers. Jack Sauter, vice president of marketing for the Cleveland Electric



At the keyboard, Dr. H. G. Alles demonstrates the Bell Laboratories sound synthesizer as programmer Dr. Douglas Bayer looks on: "By commanding sounds that resemble strings, brass and percussion, a musician can orchestrate a composition as he plays it."

seems to be there one minute, but disappears the next? Scenic designers have been fascinated by the idea of using holograms on the stage, but are usually frustrated by the fact that conventional holograms tend to be small and need to be viewed practically head-on; if the viewer moves too far to the right or left, the image begins to vanish, and in a conventional theater, only a few central rows would get the desired effect. But Emmett Leith, the University of Michigan scientist who inaugurated modern holography, says that only high-cost prevents holograms from being large enough for practical stage use, and that a new development known as the "multiplex" hologram can be viewed from any direction of the compass.

And holographic TV? Edward Villella dancing in three-dimensional color in your living room? Leith says that true three-dimensional television is theoretically possible, "but the supporting technology has to develop."

Television can expand the productivity of the arts, and arts organizations are making plans to take advantage of this fact. Cyril Harris, the acoustics expert, reports that new halls being designed around the country include specifications for television equipment, channels for cable, and ports in the walls to allow for cameras. For several years Lincoln Center has been preparing to embark on a pay-cable endeavor, which research indicates could bring the Center enough money to enable it to close its yearly income gap of about $3 million.

A harbinger of the future may now exist in Columbus, Ohio, where three months ago Warner Communications began to operate QUBE, Warner's more than $10-million pay-cable business. QUBE offers its subscribers 30 channels of programming, including 10 "Premium Programming" channels, one of which is "Performance." Each QUBE subscriber has a small, black channel-selector box, attached by wire to another box on his television set; by pushing the appropriate channel button, the viewer signals his choice to a computer at Warner's Columbus studio. The subscriber is then charged for each program selected and billed at the end of the month. Prices range from one dollar to $3.50, with programming such as the La Scala production of "The Barber of Seville" costing $2.50.

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Harlan Kleiman, vice president of programming for QUBE, explains how the Columbus experiment should be of great benefit to arts organizations. "In our system," he says, "it's pay-per-view, so the creator is being paid on a unit basis. In other words, if 10,000 people are willing to spend $2.50 each to see an opera, that means we're grossing $25,000. Contracts all vary, but in essence what we're doing is paying the creator a percentage based on the number of people who watch." Within the next few years, Mr. Kleiman goes on to say, Warners will be taking QUBE into more cities: "Let's say we're talking about the Horowitz concert in Carnegie Hall. Now wouldn't it be wonderful if there were five other cities and there were 20,000 people in each one of those cities who would be willing to spend $5 to see him play and hear it in stereo? Now we're talking about half a million dollars. It wouldn't affect ticket sales, but would make Carnegie Hall a great deal bigger."

Says Otto Piene: "All this new technology came out of scientific and technological developments, and that makes conservatives say, 'Oh, how can you do art with these things that were not really invented for art?' Well, the answer is that technology is nothing without the imagery that fills it with power, that gives it human appeal. I see this linkage of art and technology as being in its initial stage. This is just the first century of it. I'm quite certain there will be more centuries to come." ■

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Television has also affected the economics of dance organizations. Of the 10 companies that have appeared to date on "Dance in America" since its beginning in 1976, only the Martha Graham Dance Company reports that TV exposure has not had a discernible effect on box office, funding or American bookings.

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The visual arts are registering the impact of new technologies on a variety of fronts. An "electronic palette" has recently been developed by CBS-TV and the Ampex Corporation; it allows the computer artist to "paint" on video and produce work that seems to have been made by oils, watercolor, or pen and ink. At M.I.T., Professor Nicholas Negroponte and the Architecture Machine Group plan to research "drawing with your eyes"; Professor Negroponte envisions wall-sized displays that will "walking" through three-dimensional space. Conceivably, the viewer could press a lever on the arm of his chair and take a stroll from one end of ancient Rome to the other.

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A couple of years ago, Alan Schneider was directing "The Skin of Our Teeth" at Boston University. He was mulling over the play's sweeping time shifts and wondered if he could somehow convey this movement without having to build a piece of scenery. He got together with Paul Earls, a composer and media artist at M.I.T.'s Center for Advanced Visual Studies (CAVS), and the two men discussed the possibility of using laser light. Lasers can create bright, mesmerizing beams of color, and when a laser beam is split, the fanning shafts of light can seem to be almost solid; laser light beamed onto something like a cloud of steam can seem to produce walls of light. Mr. Schneider thought the laser beams could give him the desired effects.

The plan didn't materialize. Mr. Earls

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change as you look at them. Harriet Casdin-Silver uses laser light to create holograms—delicate colored images that appear to be three-dimensional. When laser light or ordinary white light passes through a holographic plate, a seemingly realistic image is created, sometimes on the far side of the plate, sometimes on the viewer's side. Turn off the light and the image disappears. In a hologram called "Equivocal Forks," Miss Casdin-Silver uses red laser light and projects an image 34 inches in front of the plate. The deep red, seemingly tangible image hangs quietly in the air; the viewer is tempted to reach out to touch it.

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In 1975, Charles Eames made a film called "Metropolitan Overview" for New York City's Metropolitan Museum of Art. The film was a pilot proposal for a central guide to the museum's collections. At the heart of Mr. Eames's concept was a large hall equipped with computer terminals for information retrieval, closed-circuit television for seeing whether galleries were crowded or empty, and clusters of glass-enclosed "kiosks" containing videotape machines.

One year after the film was made, it was screened for Walter Annenberg and for the Metropolitan's then-director, Thomas Hoving, and the film became the basis for a proposed Fine Arts Center of the Annenberg School of Communications. The proposed Center never came about at the Metropolitan; in March 1977, reacting to controversy about the project, Mr. Annenberg with-

says that rehearsals were under way by the time he and Mr. Schneider talked, and to incorporate laser scenery at that point would have entailed costly delays.

Apart from such problems, why isn't laser light used more often in the theater? William B. Warfel, lighting director of the Yale Repertory Theater in New Haven, says the high cost is still prohibitive. According to Jules Fisher, who believes that in 1971 he became the first lighting designer to use lasers on Broadway in "Jesus Christ Superstar," laser light has no emotional or intrinsic value; it's a "gimmick."

Mr. Earls disagrees. A fairly elaborate Broadway musical, he says, could be designed for about $20,000 with operating costs of $1,000 a week. The real obstacle, Mr. Earls believes, is that theater people tend to be so set in their ways that they are disappointed when electronic scenery does not precisely duplicate the "feel" of painted and constructed sets. "The way this will get going," he says, "is when a production is conceived with laser technology from the very beginning."

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Currently, Mr. Earls and Sarah Caldwell are discussing the use of lasers to create "supernatural effects" in a production of Berlioz' "Damnation of Faust" next month. Next summer in Washington, D.C., Mr. Earls and Otto Piene, director of CAVS, will use laser projections on the outside wall of the Air and Space Museum as part of a nighttime "Sky Opera." The event will be one element in a summer-long art and technology extravaganza called

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