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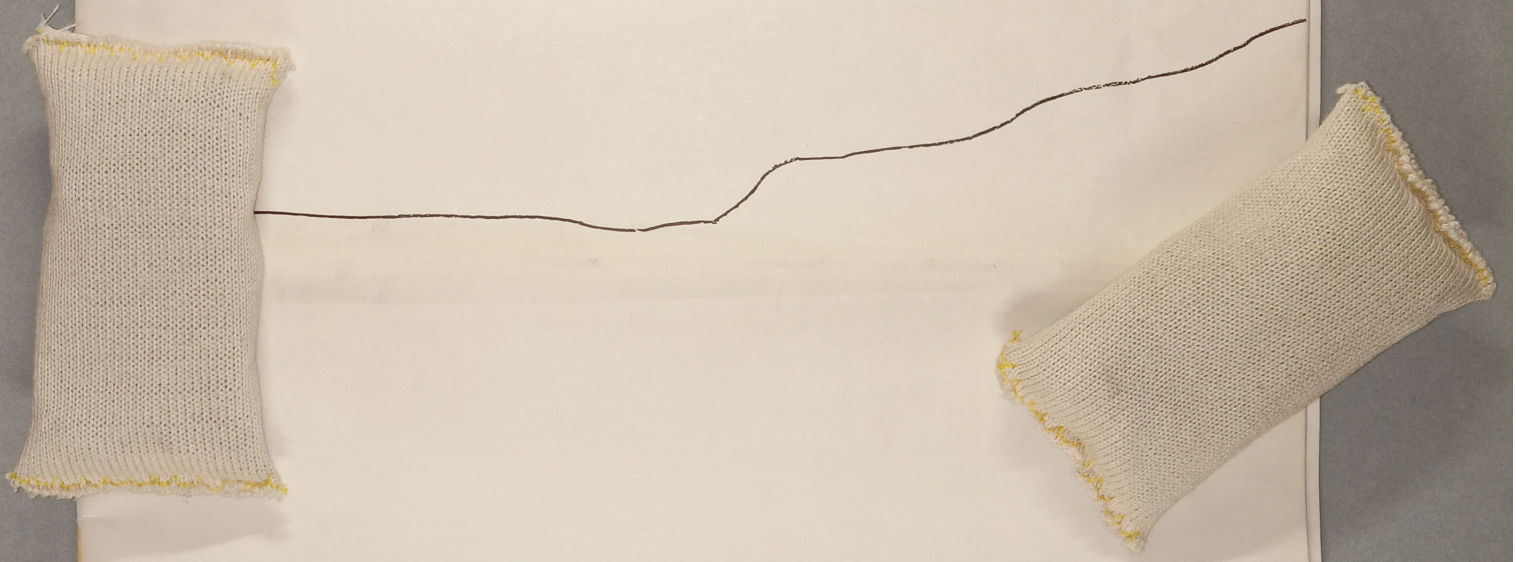
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E.A.T. CLIPPINGS

VOLUME 1, NO. 1 APRIL 1960 - JULY 1969



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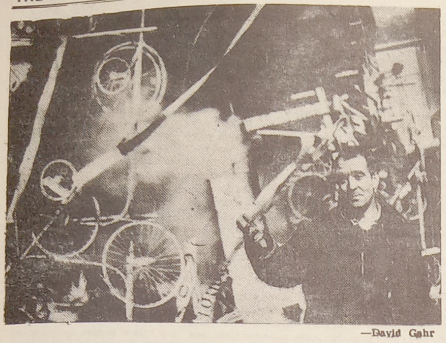
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E.A.T. CLIPPINGS

THE VILLAGE VOICE, MARCH 30, 1960



—David Gahr

The Tinguely Machine

A description of the most unusual artistic event of the year—the one-night stand of the Tinguely-built machine called "Hommage à New York." The event took place in the garden of the Museum of Modern Art in the early evening of Thursday, March 17, 1960.

by Walter Thabit

Though the event was scheduled for 6.30, the guests invited to see the-machine-which-destroys-itself begin to arrive at 5. The Time and Newsweek people have just signed the press roster, and are soon followed by the NBC television crew. Tinguely has been there since morning, assembling his machine in the garden.

Photographers are already taking pictures, while excited groups of people discuss the machine. It's a Rube Goldberg come to life, its parts all painted white, a respectable 20 feet high and 30 feet long. Basically, it runs on two sets of pulleys. In the first section, for example, a child's wagon is pulled back and forth by an arm on a wheel. But when a second switch is thrown, other wheels are set in motion, winding up a string which pulls down a trough into which are set a number of bottles. Bottles come down, the wagon swings wildly, breaking them, and the powerful motor finally upsets the whole section. That is just one of the parts of section #1. It also has a picture-making attachment, a tiny bathtub, and other reminders of home.

Around a Piano

The second section, built around a piano, is the largest. Above it rises a pipe, attached to which is a 4-foot orange weather balloon. Third is a unit built around an old addressograph, and finally there is a sort of electric car. These last three elements may well signify culture, business, and the automobile—that is, if they have any significance at all.

Jean Tinguely, a Belgian-born artist, works seriously. He is composed and sure and unhurried. Together with his crew of five (and Billy Kluver, who assisted in constructing the machine), he puts motors in place, wires heating coils to pipes, installs relays and switches, and generally arms his machine. At one point there is a large puff of smoke — the crowd is startled. A minute later, Tinguely repairs the connection with a piece of black tape and a sheet of cellophane. There is a faint smell of cordite.

By now, the crowd has arranged itself at various points of vantage. One group is sitting in chairs lined up inside the cafeteria. Another group, by far the largest, is lined up directly facing the machine in the garden itself, ignoring the inside warmth for the raw terrace and a better view. It is getting dark and a fine drizzle falls, but few leave for the shelter inside. There is a third group in the "balcony," sitting in choirs on the second floor of the main gallery.

Bathed in Light

A spotlight flashes on and off—testing. Then another. The photographers, snapping pictures incessantly up to a few minutes ago, are now standing back, waiting for the main show. As it grows darker, spotlights come on and stay on. One after another focuses on the machine — now bathed in light. In all its whiteness the machine now assumes even greater importance, it is the only center of attraction. It is a missile in countdown, Robert Fulton's steamboat, Bleriot's flying machine.

Meanwhile the arming of the machine continues. And there are the last-minute troubles. Billy Kluver rushes a part into the Museum to dry, hands it to a bystander, says he'll be back for it. A cable is in the way of the electric car, preventing its intended trajectory into one of the garden pools. The radio is tested, blares forth in a loud voice. Rolls of paper are fitted to the picture-making machines, the message tapes are hooked up. The large bottles are put into the trough of section #1, and plywood boards are laid underneath to bear the brunt of the falling machine.

The countdown is almost completed. The machine sits there, surrounded by ladders, brilliantly lit, watched by technicians who will record its every move on film, its every sound on tape. The balloon on top of the tower fills with gas. A city fireman makes a dutiful if nonplussed tour of the site, keeping well away from the machine. Finally, the ladders are moved away, but there is endless tinkering with the damned machine. The crowd is restless, a few people have already left. It is almost half-past 7. "Dadaism," says someone, meaning: "It's getting late, damn it."

In a Frenzy

Without a noticeable transition from stop to start, the machine starts to run. The wheels of section #1 are turning in a frenzy; then smoke billows forth. Smoke that clouds the machine and fans out over the audience, thick smoke, smoke which obscures everything from view. If it is Tinguely's idea of a practical joke, it is a good one—everyone laughs as the smoke finally clears away. Picture-making machine #1 starts working, but the paper roll turns backward; the dauber slashes aimlessly at the easel.

Section #2 starts its whirring when the piano bursts into a fierce flame—four or five notes are played over and over in an uneasy, timed sequence. There are a thousand clicketies—1000 little boys riding their carriage-wheel wagons down the street. The radio is silent, and Tinguely cannot get it to work. The message-tapes break and flutter in the air; the performance begins to look inept. The spinning wheels begin to lose their charm; a few, who have seen enough, depart. Section #3 is activated, almost without notice.

There is a bell-clang reminiscent of T. S. Eliot saying: "It's time, gentlemen, time . . ." and the bell clangs again. Section #4 belches red smoke, emits blasts and sparks. The fire in the piano is roaring wildly. Picture-maker #2 (on section #5) goes into action successfully. Now section #4 is moving; more heavy smoke, and then a blast from section #2. Suddenly, without warning, section #3 rears up and heels over, crashes on its side, mortally wounded.

Toward the Pool

The little electric car (section #4) is sluggish. Tinguely tinkers with it. It moves languidly, then stops. He starts it again; it moves majestically, robot-like, toward the pool. He gives it a push to increase its speed and it stops dead. Tinguely considers a moment, shrugs, and moves off.

Yellow smoke from the first machine! A ground-saucer skitters out from section #2 and heads for the photographers' circle; they scatter amid uproarious laughter. A few seconds later it reverses direction and scoots back to the mother ship. This unnerves the fireman, and at about that time the piano fire gets out of control. Kluver calls for a bit of water to cool it down, but the fireman, too far gone to treat the situation delicately, uses a CO2 extinguisher with a heavy hand and smothers the flame. Kluver jumps up and down. The crowd boos its disapproval, believing their fun is being deliberately spoiled. But the machine is not dead—it springs back to life, beats a strong tattoo, spits forth more smoke and flame. Then section #2 collapses (not in the way intended) and falls against section #1, silencing both. Fulfilling its promise, the machine has destroyed itself. There is great applause.

But the show is far from over. The crowd gaily picks up souvenir pieces of the message tapes. Jean Tinguely is besieged with admirers, some holding out the souvenirs for autographing. As Tinguely writes, a reporter is taping an interview with him in rapid-fire French, as if he were Lindberg landing at Orly; eager young French girls are shouting: "Magnifique!"

At the machine area, the smouldering fire is being put out and the machine is being torn down by the museum men. One says with deadly seriousness: "If this stuff up, I'm going to get another job." And as the men resentfully pull the great machine over with long firepoles, demolishing it more completely than ever it had been designed to destroy itself, Tinguely looks up for a moment and smiles: "Eh—splendide!"

The show is now over. It was a spectacle to rival "Eighty Days Around the World" or a missile shoot at Canaveral. We aren't likely to see anything so exciting and flamboyant in New York for years to come. Unless, that is, there's a Tinguely machine at the World's Fair in 1964.

THE NEW YORK TIMES, DECEMBER 17, 1965

SCIENTIST BRINGS ART TO HIS WORK

Billy Kluver's Skill Goes into Friends' Creations

By GRACE GLUECK

"An artist comes to me and asks, 'Can I make floating sculptures?' My first impulse is to say, 'No, you can't,'" said Billy Klüver, a research engineer. "But then I think about it and I decide, 'Yes, maybe he can.' So I try to work with him."

Floating sculptures, radio-equipped "sound costumes" for dancers and portable neon signs that hook into paintings are not top-priority projects to the scientific world. But they are of deep concern to Mr. Klüver, who has come to be known as "the artist's scientist."

By day the blond Swedish researcher, a Ph.D. in electrical engineering, is a member of the communications research staff at the Bell Telephone Laboratories in Murray Hill, N. J.

Art in the Moonlight

Hunched over a big aluminum table, he does modulation experiments with lasers, ultra-high-intensity light beams. He publishes his findings under such titles as "Laser Amplifier Noise at 3.5 Microns in Helium-Xenon" and signs his full name, Johann Wilhelm Klüver.

But in his off-hours, the 38-year-old engineer moonlights for art, tackling technical problems put to him by such experimenters as Robert Rauschenberg, Andy Warhol, Jasper Johns and John Cage.

"I have no ambition to be an artist myself," Mr. Klüver said the other day, folding his lanky frame into a chair in his cluttered research cubicle at Bell. "The challenge is to solve problems posed by the increasing involvement of art with technology."

Mr. Klüver not only helps his artist friends technically, but organizes shows of their work: several American exhibitions for Stockholm's avant garde Moderna Museet, the 1963 Pop Art Festival in Washington and a forthcoming Art and Technology exhibition in Stockholm.

He is working with Mr. Warhol on helium-filled "aerial sculptures" and with Mr. Rauschenberg on "receiving" and "sending" costumes for a forthcoming dance.

"Beauty, in the traditional sense, is no longer the exclusive domain of art," he maintains. "The spectacles produced by technology are as exciting and beautiful as the creations of artists. But research needs the intuition and insight that art provides. I think that the artist will expand science. There are things that wouldn't occur to you without him."

Mr. Klüver's first technological brush with art came in 1960, when he helped the Swiss motion sculptor Jean Tinguely put together the famous self-destroying machine, "Homage à New York."

The machine, a giant assemblage of old motor parts, used bicycle wheels, steel tubing, an addressing machine and a piano, functioned fitfully for a half-hour in the garden of the Museum of Modern Art before it collapsed, as planned, into a heap of junk.

Collaboration with Mr. Rauschenberg, begun in 1961, produced "Oracle," an orchestral ensemble of five junk sculptures that give out a complex "mix" of radio sounds.

Carrying out Mr. Rauschenberg's conception of a relationship between sound and "looking," Mr. Klüver evolved a scheme whereby five radios and a set of controls were placed in a "console" sculpture. The four other pieces each bore a receiver. By manipulating the console controls, a spectator could affect the sound of the entire group, or any piece in it. The finished work was exhibited last spring at the Leo Castelli Gallery.

Red-Letter Picture

Mr. Klüver's "clients" (he doesn't charge for his time) tend to be exacting. Once he made a neon R for a painting by Jasper Johns, probably the first portable neon sign anyone ever had occasion to make.

"I did it with a short wave transformer and battery," the scientist recalls. "But it had to be redone. I had made it blue, and Jasper insisted that R was a red letter."

Artists, Mr. Klüver believes, are generally more open to science than scientists are to art. But he says that his cerebral colleagues at Bell provide ideas and technical help, in their spare time, for his work with artists.

Home for Mr. Klüver, his wife, Olga, and their eight-month-old daughter, Maya (Swedish for "Maria"), is the placid suburb of Berkeley Heights, N. J.

Their house at 69 Apple Tree Row, a scant seven minutes' drive from the laboratories, is filled with works by artist friends. A Jasper Johns lithograph hangs in the hall, a Claes Oldenburg lithograph of a pizza pie (a wedding present from the artist) decorates the mantel and a plaster roast beef, also by Oldenburg, adorns the piano.

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THE VILLAGE VOICE, AUGUST 12, 1969

dance

BILLY KLUVER

by Jill Johnston

Billy Kluver is a tall blond Swede who has lived in the U. S. since 1954. After five years at the Royal Institute of Technology in Stockholm he went to the U. of California at Berkeley and obtained a Ph. D. in Electrical Engineering. Since 1959 he's been a member of the technical staff of Bell Telephone Laboratories in Murray Hill, New Jersey. Kluver is one of 300 Ph. D.'s at the Labs, each of whom occupies a room for independent research. First time I heard about Kluver it was in connection with Jean Tingueley's self-destroying machine called "Homage to New York" which happened in the sculpture garden of the Museum of Modern Art on March 17, 1960. I heard that Kluver was a smart scientist and a friend of artists and that he was helping Tingueley assemble the materials for his machine. Kluver and Tingueley have been friends since '52 or '53. At that time Tingueley was making what he called anti-tiv sets with motorized devices, "putting Malevich in motion." The two were friends of Pontus Hulten, who became director of the Modern Museet in Stockholm in 1955. Later, in 1961, Kluver was to be responsible for the American contribution (20 artists) to an exhibition of "Art in Motion" at the Moderna Museet. The following year he assisted in organizing a show of "Four Americans" there (Johns, Rauschenberg, Leslie, and Stankiewicz). In America, in '61, he appeared in Claes Oldenburg's "Store Days I," a happening in a series of 10 that Oldenburg gave at his store on 2nd Street. In 1962 Kluver organized a pop art show in Philadelphia; in '63 the Pop Art Festival in Washington, D. C.

Beginning 1961 Kluver and Robert Rauschenberg discussed a project for a "sound sculpture" that was not to be completed until spring '65 in Rauschenberg's latest exhibition, called "Oracle," an orchestral ensemble of five sculptures. Kluver says there was a difficult technical problem involved because Rauschenberg didn't want any cords running from the objects to the control board. He wanted a maximum flexibility in the arrangement of the sculptures, that they might be moved in any relation to each other. Final scheme: the controls plus the five radios were placed in one sculpture and the four other sculptures contained a receiver and amplifier apiece, each one corresponding to a radio in the console sculpture. The manipulation of the volume and tuning speed of the five radios was up to the spectator, for whom the controls were available if he cared to see them and use them.

Small 'Room'

At Bell Labs Kluver's "room" is a rather small rectangular area, its floor space almost completely filled up by a big table containing instruments related to problems that presently concern him. The table "floats" on airplane tires in order not to be disturbed by the vibrations of the building. One thing he has been working on the past year or so is the measurement of the spontaneous emission of light in laser amplifiers. Kluver's assistant came in to pick up a box containing one of the vital instruments used by John Cage in his performance of "Variations V" at Philharmonic Hall July 23. The assistant was taking the box down the corridor to another room to make some adjustments on the instrument before Cage arrived to take the box away on another round of performances. For "Variations V" Cage wanted sound to be generated by the motion of dancers who would be going on their own steam, according to choreography by Merce Cunningham. Cage discussed the project with his colleague, David Tudor. Tudor knew of a man called Robert Moog, who has a business in Trumansburg, New York, making electronic musical instruments. Last May Tudor and Cage went to see Moog, who agreed to provide 12 antennae (poles) with a triggering device based on the Theremin principle. In effect, the antennae would pick up sounds along their length by the relative proximity of a body. Cage wanted to know if the antennae would be sufficient to meet his purpose. Tudor thought there should be more mechanisms, or something at least that would be untraceable. If the visible antennae led the audience to link the sound with its source, another type of mechanism less detectable should also be provided. Tudor wanted a sonar device, but that was too expensive. Then he thought there might be somebody at Bell Labs who could tell them about photoelectric cells. In June they contacted Kluver and went to Murray Hill, first actually to talk to a man who made four designs that they decided were not practical. Kluver was present at the meeting and he offered to make photocells to test. Considered and discounted as an additional possibility was a device that might pick up currents in the skin and muscles that could be translated into sound. This was related to something Kluver worked out for Yvonne Rainer in '63, a wireless microphone at the throat which amplified the sound of the dancer's breathing.

Photocells on Stage

Anyway, Kluver made 10 photocells (they vaguely resemble pistols) that would be scattered round the stage and would activate switches when the shadows of the dancers crossed their nozzles. The switches would in turn activate 10 tape recorders and 10 short wave radios. The system required a control console. Kluver found the man who could design a transitor circuit. C. H. Coker of Bell Labs designed the circuit and W. N. Wittnebert, the assistant mentioned above, made it. Cage and Tudor had previously decided to use the mixer designed by Max Matthews, director of Behavioral Research Laboratories at Bell, for the performance a year ago of Cage's "Atlas Eclipticalis" at the Philharmonic. The mixer is the central control board with 60 inputs by which Cage could control the volume and put the sound on one of six speakers around the hall. Whenever a dancer, by his shadow, triggered a radio or a tape recorder so that it became connected to the mixer (after passing through the convergent circuit), a connection that would last 15 seconds, Cage "received" the sound and manipulated volume and speaker placement. Ultimately, he had great power, for although he couldn't control what was coming in, he could turn the whole thing off if he felt like it.

The mixer, by the way, was presaged in an aborted project that also involved Max Matthews. When Richard Lippold was commissioned to make a sculpture for the new Pan Am Building he heard that the building contractors were going to install Muzak in the room where his sculpture would be. Lippold suggested that Cage supply this musical ornamentation instead. Cage contacted Matthews, who designed a circuit that would have controlled 200 loud speakers independently, and fragmented what was coming from them. The system as planned was similar to the one Kluver masterminded for "Variations V." The sound sources were to be the material provided by Muzak and the people walking through the building. The people would activate photoelectric cells to stimulate the Muzak material to be distorted by Matthew's control system and sent out over the speakers. The automatic permutation of sound would never have repeated a pattern in a period of 59 years. The management of Pan Am vetoed the project.

A visual conception for "Variations V" that might also have involved Bell Labs was a complement to the sound system. Television cameras were to pick up the dancers and send the images, distorted by Nam June Paik, onto huge television screens situated in the audience. This scheme, like the sonar device, was too expensive to go beyond the talking stage. Instead, Stan VanDerBeek provided films that combined predistorted TV images by Paik and shots of Cunningham and his company. The original idea would obviously have been more in keeping with the auditory system. As it was, VanDerBeek's film, projected onto an enormous screen conventionally located, was such a visual tour de force that it tended to dominate all effects. Ideally, no doubt, the dancers themselves should be disported in the round, either in the center of a peripheral audience or vice versa or both, and suspended on platforms as well. While the imagination is at it, maybe another world's fair or the like will produce an enterprising architect to construct something really fantastic in the way of a building to suit Cage's diabolical designs. The closest the fair has come to it was a Screamatorium suggested, probably not even considered, for the first New York fair, by a couple of nutheads with sound judgment.

Future possibilities of collaboration between scientists, artists, architects, etc., await only sanctions from private and official sources to support ambitious ideas. On a certain scale, more has been done than is generally known. Before leaving Bell Labs I saw the IBM Computer room. Kluver told me a little about the "computer music program" and the fact that James Tenney, New York composer, spent 2 years at Bell Labs making computer music. Coincidentally, a week later, I see the 1965 issue of "Impulse," an annual of dance published in California, with two articles about a computer dance program at the U. of Pittsburgh.

Kluver's idea about science in relation to art is that science and art have nothing to do with each other. As a collaborator he is interested only in providing the scientific unit that will make the artist's idea practically feasible. He is not interested in making a technical "process," an invention, like a new kind of musical instrument or any systematic machine, that could be used by artists for composition or execution of work. At the moment, he says, he continues to enjoy contributing a functional unit for one specific purpose. His most recent collaboration is with Andy Warhol, for an exhibition this fall at the Castelli gallery. In 1963-64 he designed a circuit for Jasper Johns that would drive two neon signs on batteries. Probably the first portable neon sign. But Kluver is much more than designer and consultant in his involvement with artists. As friend and supporter and avid enthusiast of contemporary forms, as well as an engineer generous with his time and knowledge, he's a unique man behind and in front of the scenes. Kluver exemplifies the consciousness he described himself in a short article for the Hasty Papers in 1960, "Fragment on Man and the System." He said he thought man had the responsibility to shape the general systems in such a way that the general systems corresponded as closely as possible to the requirements of the individual realities. Kluver bridges both worlds for a mutual compact that is I guess, and I conventionally believe it, one big way out or ahead of the thing the newspapers are always scaring us about. He also said that "the system builder and the technology have the capacity of providing the individual with any type of system, involving any degree of uncertainty or change: a system could even be designed to disintegrate itself." I don't know whether he wrote that before or after the Tingueley affair at the Modern.

LIFE, AUGUST 12, 1966

A good janitor becomes as important as a curator

by DAVID BOURDON

Kinetic art creates special and challenging maintenance problems for museum curators, art dealers and collectors. Accustomed to art works that hang silently or stand motionless and require only an occasional dusting, they find themselves confronted by noisy, heaving assemblages that make scuff marks, blow fuses and wear out. An art connoisseur who is expert at detecting quattrocento tempera is utterly innocent of any knowledge of electronic circuitry. Where he might turn to an artist's preliminary drawing for insight into the finished painting, he is reduced to helplessness when confronted with a kinetic artist's blueprint. He may reach such desperation that he looks on the piece no longer as a work of art but as a mere assemblage of moving hardware.

Very few shows have taxed the ingenuity of museum staffs more thoroughly than the recent Schöffer-Tinguely exhibition assembled by the Jewish Museum. Installing it took twice as long as other exhibitions and it was the most expensive show ever to appear there. Part of the expense was due to the artists' insistence that the works be chaperoned by two technical assistants. Tinguely's pieces kept breaking down under constant usage. Because of his penchant for odd scrap materials and his method of slapdash welding ("He is not the best welder of our day," confided a technical assistant), one or two Tinguely machines were inoperative at all times. The staff had to scavenge the city for replacement parts of comparable vintage and character. They found junkyards and surplus stores to be useful sources for such items as bicycle wheels and sewing machine pedals.

Restoration of a kinetic work is a ticklish job. An artist might disavow his work if the motor's speed were significantly altered or if a replacement part were not in keeping with his original conception. A conscientious electrician could all but destroy a work, especially if he made it function perfectly.

By the time the Schöffer-Tinguely show reached the Washington Gallery of Modern Art, the small motors that Schöffer uses in his carefully designed works began to burn out with increasing frequency. Because they were 50-cycle European motors, rather than 60-cycle U.S. motors, new ones had to be air-expressed from France. The director made frequent trips to the airport, each time having to convince U.S. customs men that the brand-new motors were not pieces of machinery but parts of art works and therefore duty free.

For shipment the works were disassembled and carefully crated. When they reached Pittsburgh, the museum found assembling them was like piecing together jigsaw puzzles. "When the job should have been finished," the director recalls, "we discovered we had several pieces of hardware left over. We could have fabricated another work of art, but after double-checking we determined where they belonged and the show opened with everything in place." They were able to get help from an unexpected source—their own maintenance staff. "The janitors," says a curator, "became very excited and interested. They had something to do. It was like being a technical assistant." Another museum official says, "We know now that for a show like this a good maintenance man is as important as a good curator."

The whole staff had to become alert to the characteristic sound of each work in order to know when a motor was off pitch or was humming when it was supposed to keep mum. But the din created by nearly 70 motors put a severe strain on the nerves of the staff, whose ears rang far into the night. The show created so much racket that in Pittsburgh the museum switched guards from location to location every two days so they wouldn't be driven nuts by repetitive squeaks, gongs and clangs.

Until this show stressed the need for mechanically minded custodians, few curators or dealers bothered to get to the source of a mechanical failure. Instead they called on Billy Klüver, the Mr Fix-It of kinetic art. A 38-year-old Swede with a Ph.D. in electrical engineering, Johan Wilhelm Klüver is a staff member of the Communications Sciences Division at New Jersey's Bell Telephone Laboratories, where he experiments with lasers. A museum man calls Klüver "the Edison-Tesla-Steinmetz-Marconi-Leonardo da Vinci of the American avant garde." Klüver is pretty patronizing about museum people: "The whole idea of the machine scares them so much that they can't move."

Klüver does not consider himself a repairman. "I'm more interested in the other end of the spectrum—creating art." In his free time, and without fee, he executes technical equipment for artist friends who require mechanisms that no scientist would ever dream of.

In 1962 Jasper Johns told Klüver he wanted to include a neon letter in one of his paintings. Johns wanted the painting to be cordless, but neon tubes need very high voltage. Klüver couldn't just stack up a lot of batteries to achieve it and he set out to design a power supply that would satisfy Johns. The result is probably the first portable neon sign ever made. It produced a dividend for Klüver. He used the same idea to make the first portable gas laser, which he finds a convenience in his work.

The most difficult piece Klüver ever tackled was Robert Rauschenberg's *Oracle*, a quintet of wheeled junk sculptures, electronically orchestrated to produce a complex spectrum of radio sounds which can be constantly altered at the controls. Rauschenberg wanted *Oracle* to be cordless so that individual radio-sculptures could be endlessly repositioned. Klüver gave him what he wanted after three years of sporadic work during which time two complete technical systems were finished and junked. The final product is a complex system of sculptures, amplifiers, transmitters and receivers. Klüver considers *Oracle*'s technical elements to be "just as much a part of the work as the paint in a

LIFE, AUGUST 12, 1966 CONT'D.

painting." Rauschenberg agrees and the console unit is signed by both the artist and the engineer.

The equipment alone cost $6.000 and only a successful artist like Rauschenberg could have afforded it. Other kinetic artists have to surrender their grandiose concepts for lack of money or find a rich patron. Schöffer has done this—the huge Philips' Lamp company puts up money for his work.

Klüver's contribution to art is not always technical: he organizes exhibitions, performs in happenings and writes for art magazines. One of his goals has been to develop a scientific brain trust to aid artists. Under his supervision 10 American artists, composers and choreographers have been working

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Klüver is no…

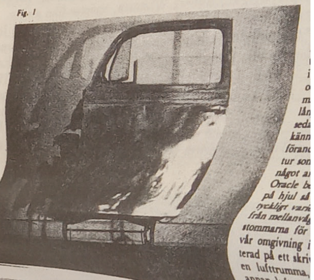
KONSTREVY, FEBRUARY 1966

"T…

AV BILLY KLÜVER

Den i USA bosatte svenske elektronikforskaren Billy Klüver … ver i denna artikel om den grupp av ljudskulpturer, »Oracle», … Robert Rauschenberg tillsammans med artikelförfattaren arb… med under tre år. Arbetet med »Oracle» har givit en anvisn… om vilka uppgifter som kan komma att bli konstnärernas i … samhälle som skall överleva tack vare — inte trots — teknik… Klüvers beskrivning av arbetet avslöjar ett fascinerande växelsp… mellan tekniker och konstnärer: Vilka beslut, under arbete… gång, var tekniska och vilka var estetiska? Teknikern Klüve… anser att tekniken är obegränsad men teknikern begränsad oc… »konstnären, och endast konstnären, kan visa ingenjören hur tek… nologin skall användas till sin fulla kapacitet». Fotografierna har tagits av Billy Klüver och Robert Rauschenberg.

Fig. 1



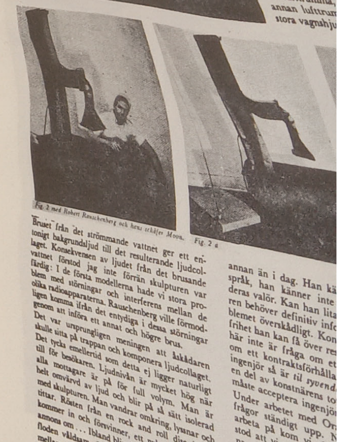


Fig. 2 med Robert Rauschenberg och hans schäfer Moon. Fig. 2 a

… lån… seda… känn… förän… tur son… något a… Oracle b… på hjul så… tyckligt vari… från mellanvåg… stommarna för… vår omgivning i… terad på ett skriv… en lufttrumma,… annan lufttrum… stora vagnshju…

Bruset från det strömmande vattnet ger ett entonigt bakgrundsljud till det resulterande ljudcollaget. Konsekvensen av ljudet från det brusande vattnet förstod jag inte förrän skulpturen var färdig: I de första modellerna hade vi stora problem med störningar och interferens mellan de olika radioapparaterna. Rauschenberg ville förmodligen komma ifrån det entydiga i dessa störningar genom att införa ett annat och högre brus.

Det var ursprungligen meningen att åskådaren skulle sitta på trappan och komponera ljudcollaget. Det tycks emellertid som detta ej ligger naturligt till för besökaren. Ljudnivån är mycket hög när alla mottagare är på för full volym. Man är helt omvärvd av ljud och blir på så sätt isolerad med skulpturen. Man vandrar omkring, lyssnar och tittar. Rösten från en rock and roll disc jockey kommer in och försvinner, ett nyhetsprogram, en annons om ... Ibland blir det tyst, ibland blir ljudfloden våldsam. Oracle visar den stora skillnaden mellan att se och samtidigt lyssna och att bara se. Att vara omvärvd av ljud på detta sätt tvingar till en ny upplevelse.

Vandrar vi med övernaturlig hörsel genom staden och lyssnar till alla tusen radiomottagare ...?

... XR ...

Svårigheterna som uppstod under arbetet med Oracle var kanske inte så mycket av teknisk karaktär (i och med att vi hade bestämt oss för den principiella lösningen var de tekniska problemen normala), som i samarbetet med Rauschenberg. Jag menar inte att Rauschenberg är på något sätt svår att ha att göra med; han är i själva verket ett under av tålamod. Det är helt enkelt svårt för en ingenjör att föra konversation med en konstnär. Ingenjören talar långsamt och med en naturlig tvekan. Han vet att problemet kan lösas, även om han inte kan ge lösningen på stående fot. Han är bekymrad över kostnaderna och behöver tid för att experimentera och finna ut vilka material som finns tillgängliga. Han försöker pressa en mer detaljerad beskrivning från konstnären. Vad är målet? Hur starka förstärkare behövs? Vilken brusnivå är tillåten? Kan interferens mellan lokaloscillatorerna från de olika radioapparaterna tillåtas? Vad var den maximala och minimala svephastigheten? Skulle det vara möjligt för åskådaren att ställa in en given station? Hur stabil skulle frekvensen på lokalsändarna vara? Hur många timmar skulle batterierna hålla? Konstnären å sin sida arbetar snabbt och med sina händer. Han arbetar med fakta och vill inte binda sig till teoretiska detaljer som gäller en framtid. Om en månad, eller ett år kanske hans inställning är en helt

annan än i dag. Han kä… språk, han känner inte … deras valör. Kan han lita … ren behöver definitiv info… blemet överskådligt. Kon… frihet han kan få över re… här inte är fråga om et… om ett kontraktsförhålla… ingenjör så är *til syvend…* en del av konstnärens to… måste acceptera ingenjö… Under arbetet med Or… frågor ständigt upp. N… arbeta på kom vi aldri… stod att vi måste arbet… na, med en sådan marg… så stor frihet som möj… sätt fanns den höga lj… sprungliga specifikation… Rauschenberg en möjli… andra sidan var varje … högtalare av god kvali… förstärkarna) och dess … mindre högtalare av … Oracle fordrade en g… dålig ljudkvalitet. (I… till någon annans rad… En annan roande frå… vilket var ett teknisk… »estetiskt» beslut? Fä… på kontrollrattarna, … komponenterna var … för en ingenjör att b… på med och fatta be… »vackert» i stället fö… vändigt. Ingenjören f… ler på med som »ko… »konstnärs». Beträffa… lösning blev samarbet… intimt.

... »BUDSKAPET» …

Vi har fått lära oss … andra objekt i ett ru… baksida. Under ett … tvingas vi godtaga e… av kompositionen. C… soner som han använ… sig själva (i de flesta… medvetna om detta). … happeningen för en b… den individuella blygh… etc en del av happeni… inte säga oss något an… rialet i Oracle är …

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painting." Rauschenberg agrees and the console unit is signed by both the artist and the engineer.

The equipment alone cost $6,000 and only a successful artist like Rauschenberg could have afforded it. Other kinetic artists have to surrender their grandiose concepts for lack of money or find a rich patron. Schöffer has done this—the huge Philips' Lamp company puts up money for his work.

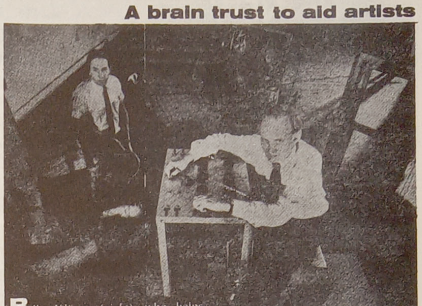
Kliiver's contribution to art is not always technical: he organizes exhibitions, performs in happenings and writes for art magazines. One of his goals has been to develop a scientific brain trust to aid artists. Under his supervision 10 American artists, composers and choreographers have been working since last January in collaboration with scientists and engineers to create theater and dance pieces that will make new demands on present-day technology. The first result of this will be seen in New York this fall at the Festival for Art and Technology, which will take place in the same armory as the 1913 Armory Show and may go down in art history as another landmark.

"The artist has an immediate, intuitive way of working, taking only the material at hand," Klüver says, "while an engineer proceeds logically and slowly toward an end. The engineer is no visionary about life. But the artist is. Only he can create disorder and still get away with it. The use of the engineer by the artist will stimulate new ways of looking at technology."

Klüver is not interested in teaching artists any new skills or processes which they can apply to their art. Nor does he have much hope that he could. "All of the art projects that I have worked on," he says, "have at least one thing in common: from an engineer's point of view they are ridiculous."

Nevertheless, he still does his best to keep things going. Last December the Guggenheim Museum telephoned frantically. The neon letter in Jasper Johns's painting wouldn't light up. Klüver got out all the drawings and hurried to the museum. When he arrived, he found Johns sitting next to his painting, the red neon letter glowing brightly. "It looks like they forgot to throw the switch," said Johns. The switch lay on the surface of the painting where no curator had recognized it as real.

A brain trust to aid artists



Billy Klüver (*right*), who helps build and service kinetic works, sits at controls of the complex sound system he designed for a five-piece sculpture by Robert Rauschenberg (*left*).

avid enthusiast of contemporary forms, as well as an engineer generous with his time and knowledge, he's a unique man behind and in front of the scenes. Klüver exemplifies the consciousness he described himself in a short article for the Hasty Papers in 1960, "Fragment on Man and the System." He said he thought man had the responsibility to shape the general systems in such a way that the general systems corresponded as closely as possible to the requirements of the individual realities. Klüver bridges both worlds for a mutual compact that is I guess, and I conventionally believe it, one big way out or ahead of the thing the newspapers are always scaring us about. He also said that "the system builder and the technology have the capacity of providing the individual with any type of system, involving any degree of uncertainty or change a system could even be designed to disintegrate itself." I don't know whether he wrote that before or after the Tinguely affair at the Modern.

f.
2 Jasper Johns told Klüver
ed to include a neon let-
ne of his paintings. Johns
the painting to be cord-
neon tubes need very high
Klüver couldn't just stack
of batteries to achieve it
set out to design a power
that would satisfy Johns.
ult is probably the first
neon sign ever made. It
d a dividend for Klüver.
the same idea to make the
rtable gas laser, which he
convenience in his work.
most difficult piece Klüver
kled was Robert Rauschen-
Oracle, a quintet of wheeled
ulptures, electronically or-
ted to produce a complex
m of radio sounds which
constantly altered at the
ls. Rauschenberg wanted
to be cordless so that indi-
radio-sculptures could be
sly repositioned. Klüver
him what he wanted after
years of sporadic work dur-
hich time two complete tech-
systems were finished and
d. The final product is a com-
ystem of sculptures, ampli-
transmitters and receivers
r considers *Oracle*'s techni-
ements to be "just as much a
of the work as the paint in a

"TEKNOLOGI FÖR LIVET"

AV BILLY KLÜVER

Den i USA bosatte svenske elektronikforskaren Billy Klüver skriver i denna artikel om den grupp av ljudskulpturer, »Oracle», som Robert Rauschenberg tillsammans med artistförfattaren Arbetet med under tre år. Arbetet med »Oracle» har givit en anvisning om vilka uppgifter som kan komma att bli konstnärernas i ett samhälle som skall överleva tack vare — inte trots — teknike:.. Klüvers beskrivning av arbetet utvisar ett fascinerande växelspel mellan tekniker och konstnärer: Vilka beslut, under arbetets gång, var tekniska och vilka var estetiska? Teknikern Klüver anser att tekniken är obegränsad men teknikern begränsad och »konstnären, och endast konstnären, kan visa ingenjören hur teknologin skall användas till sin fulla kapacitet». Fotografierna har tagits av Billy Klüver och Robert Rauschenberg.

Fig. 1

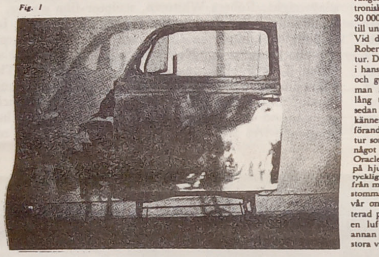


Fig. 2 med Robert Rauschenberg och hans sköldpadd Moon.



Fig. 2 a

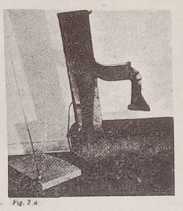


Fig. 3

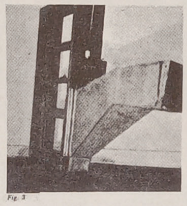


Fig. 3 a

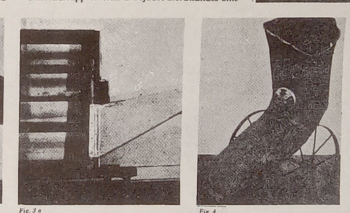


Fig. 4

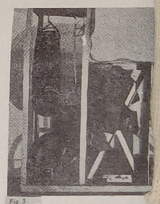


Fig. 5

Bruset från det strömmande vattnet ger ett eriotiskt bakgrundsljud till det resulterande ljudcollaget. Konsekvenser av ljudet från det bruande vattnet förstod jag inte förrän skulpturen var färdig: I de första modellerna hade vi stora problem med störningar och interferens mellan de olika radioapparaterna. Rauschenberg ville förmodligen komma ifrån det entydiga i dessa störningar genom att införa ett annat och högre brus.

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Under arbetet med Oracle kom många av dessa frågor ständigt upp. Någon rationell metod att arbeta på kom vi aldrig fram till. Men jag förstod att vi måste arbeta, oberoende av kostnaderna, med en sådan marginal att Rauschenberg hade så stor frihet som möjligt inför resultatet. På så sätt fanns den höga ljudnivån inte med i de ursprungliga specifikationerna för systemet. Vi gav Rauschenberg en möjlighet som han utnyttjade. A andra sidan var varje förstärkare försedd med en högtalare av god kvalitet (som motsvarade effektförstärkarna) och dessa ersatte Rauschenberg med mindre högtalare av sämre kvalitet.

Oracle fordrade en god ljudnivå med en relativt dålig ljudkvalitet. (Intrycket av att man lyssnar till någon annans radioapparat).

En annan roande fråga dök också ständigt upp: vilket var ett tekniskt beslut och vilket var ett »estetiskt» beslut? Färgen på batterierna, storleken på kontrollrattarna, placeringen av de tekniska komponenterna var »estetiska» beslut. Det är lätt för en ingenjör att bli fångad av vad han håller på med och fatta beslut på basis av vad som är »värkert» i stället för vad som är tekniskt nödvändigt. Ingenjören får inte behandla vad han håller på med som »konst» eller konstnären som en »konstnär». Beträffande de »estetiska» frågornas lösning blev samarbetet med Rauschenberg mycket intimt.

. . . »BUDSKAPET»

Vi har fått lära oss att tavlan är ett objekt bland andra objekt i ett rum. Jasper Johns visar tavlans baksida. Under ett musikstycke av John Cage tvingas vi godtaga *alla* ljud som en likvärdig del av kompositionen. Claes Oldenburg åker de personer som han använder i sina happenings spela sig själva (i de flesta fall är inte aktörerna själva medvetna om detta). Oldenburg skriver rollerna i happeningen för en bestämd person. På så sätt blir den individuella blygheten, nervositeten, sexigheten etc en del av happeningen. Traditionen kan därför inte säga oss något annat än att det tekniska materialet i Oracle är en del av skulpturen på samma »MEDIET . . .»

Vi hade arbetat på den tekniska utrustningen av Oracle i ungefär tre år innan den blev färdig. Vi arbetade inte oavbrutet förstås, men tillräckligt engagerat för att olösta problem ständigt skulle ligga och gnaga. Min assistent på labbet, Harold Hodges, utförde största delen av konstruktionsarbetet. Det föreföll mig som om jag tillbringade mesta tiden i oändliga köer i de elektroniska varuhusen. Två fullständigt färdiga system byggdes och refuserades som tekniskt otillfredsställande. Det sista och tredje byggdes under slutet av sextiofyra och början av sextiofem och installerades under de sista veckorna före öppningen den 15 maj 1965. Min dotter föddes samma dag och inte förrän en vecka senare kunde jag konstatera att systemet fungerade över förväntan. Kostnaderna för de elektroniska komponenterna hade då uppgått till över 30 000 kronor, medan arbetskostnaderna uppgick till ungefär 15 000 kronor.

Vid det här laget behövs det knappast sägas att Robert Rauschenbergs Oracle är en magnifik skulptur. Det är ett konstverk som sammanfattar mycket i hans produktion och som dessutom pekar framåt och ger en aning om vad som kan komma. När man arbetat så nära en konstnär under en så lång tid och hunnit tröttna många gånger och sedan ändå blir jättelikt förbluffad över resultatet känner man mer än nånsin det specifika och hänförande i konstnärens sätt att se. Oracle är en skulptur som måste upplevas; en beskrivning av den är något annat.

Oracle består av fem enheter som är fritt rörliga på hjul så att deras inbördes placering kan godtyckligt varieras. Från varje enhet hör man ljudet från mellanvågsbandet på en radioapparat. Grundstommarna för varje enhet utgöres av delar från vår omgivning i staden. Fig. 1: en bildörr monterad på ett skrivmaskinbord, Fig. 2: ett kar med en lufttrumma, Fig. 3: en fönsterram med en annan lufttrumma, Fig. 4: ett ventileringsrör på stora vagnshjul, Fig. 5: en förstorad trappa av aluminium (den enda speciellt tillverkade konstruktionen samt den som innehåller de flesta av de tekniska komponenterna). Alla enheterna utom trappan har sålunda varit i tjänst tidigare. De har (utom bildörrens utsida) fått behålla sin naturliga obestämda färg och yta; det enda starka färgelementet är de knallröda RCA batterierna. Kritiker har kategoriserat Oracle som en skrotskulptur. Med skrot menar man vanligen inom konsten objekt som har patina, nostalgi och egendomliga mångtydiga former. Oracle hör inte till skrotkategorin. Det är omöjligt att finna någon sentimentalitet eller annat värde i delarna. Dom blev lösryckta från staden i förrgår. Färgen, ytan och smutsen har samma verklighet som staden. Färgen på bildörren avlägsnades så att den verkade »ny». Överallt på skulpturen fäster man sig vid små detaljer: en gammal färgburk instoppad i fönsterramen, rader av för långa skruvar med muttrar, en egendomlig grönaktig beläggning inuti ventileringsröret osv.

Karet (Fig. 2) är fyllt av vatten som cirkuleras genom lufttrumman och som i form av en dusch åter sprutas ner i karet. Pumpen som driver duschen är anluten till en väggkontakt. Den elektroniska apparaturen drives helt av batterier för att erhålla den önskade rörligheten. Det maximalt tillåtna avståndet mellan trappan och de övriga delarna är ungefär 100 meter. Driftukostnaderna är ungefär 75 öre timmen och vissa av batterierna måste bytas efter 20 timmars drift.

Ljudanläggningen fungerar på följande sätt. Trappan (Fig 5) innehåller fem GE radiomottagare för mellanvåg utan högtalare. På toppen av trappan sitter två kontroller för varje radiomottagare, en som reglerar *ljudnivån* och en som reglerar *hastigheten* (se också nedan) på en motor som driver ratten för stationsinställningen på radiomottagaren. Vidare finns där en strömbrytare för varje apparat och en för varje motor. Fyra av radiomottagarna är anslutna till fyra COMREX radiosändare som moduleras av audiofrekvensen från radioapparaterna dvs ljudet återutsänds omedelbart på en annan våglängd (omkring 30 Mc/s). I de fyra övriga enheterna av skulpturen finns högfrekvensmottagare som arbetar på samma frekvens som var och en av sändarna i trappan. Varje högfrekvensmottagare är försedd med en tio watt förstärkare samt en högtalare. På så sätt är varje radiomottagare för mellanvåg i trappan ljudkälla till sin egen skulptur. Ljudstyrka så väl som stationsinställning (svephastigheten) kan regleras från trappan. Den femte radiomottagaren i trappan är direkt ansluten till en förstärkare samt till en högtalare. Högtalarna var alla installerade av Rauschenberg och ljudkvaliten var bestämd av honom. Ventileringsröret har ett dovt basljud. I fönsterkarmen sitter högtalaren i lufttrumman som ger en våldsam resonans. Det är nästan omöjligt att uppfatta vad som sägs. I karet sitter apparaturen i en liten släpvagn. Högtalaren ger ett klart och tydligt ljud ifrån sig. Ljudet från trappan är också klart och tydligt medan bildörren ger en stark resonans.

Fig. 1 a



Fig. 3 a

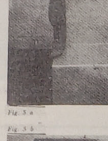


Fig. 5 a



Not: Underrubriken, »Medier . . . är . . . budskapets, är hämtad från Marshall Mc Luhan, professor i engelska och chef för Institutet för kultur och teknik vid universitetet i Toronto. Mc Luhan har bland annat utgivit »The Gutenberg Galaxy. The making of typographic man» och »Understanding Media. The extension of man». Hans problemställning är att vi inte vet hur starkt vi influeras av de nya media, men det tycks vara viktigt att observera vilka deras influtanden är. (Uppg. fr. Knut Wiggen. Red.)

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ELECTRONIC NEWS, AUGUST 22, 1966

THE NEW IMP THEATRE ART INTERFACE TECHNOLOGY

By NAT SNYDERMAN

NEW YORK. — The Armory Show of 1913 with its "Nude Descending the Staircase" and other works by the young, modern "wild beasts" of art, rocked the critics and public of its day with an explosion.

There will be another show in the 69th Regiment Armory in October, with some topnotch engineers and artists acting as collaborators, or accomplices, if you prefer.

An explosion, literally, may occur, but the public in the last half century has learned to rock in stride. Billy Kluver, a Bell Telephone Laboratories laser researcher and spare-time organizer of the show, describes it as "theatre of involvement" in that the artists are fully involved in the realities of this third of the 20th Century.

But a reporter, listening to Kluver and watching his wife, Olga, demonstrate a carefully paced, timed and controlled dance she will perform in the show, felt otherwise. Rather than an explosion or involvement, this theatre, he thought, may be described as implosive. Theatre of Implosion, or Imp Theatre, will do nicely.

And if Imp Theatre suggests that the artists are doing a little leg-pulling, this is unlikely to come as a shock to those involved since such suspicions usually accompany the search for new horizons in all art forms.

At any rate, the show, formally called "Festival of Theatre and Engineering" will be, in Mr. Kluver's words, "a new interface" between technology and art.

Interaction.

This collaboration, he explains, "is one in which the artist makes use of the inventiveness and skills of an engineer. The artist incorporates the work of the engineer in the painting or sculpture or performance. A characteristic of this kind of interaction is that generally only one work of art results."

What is likely to result is a mixture of kinetic, pop and audio art; a discotheque happening; dancers wired for sound and light and color control, electronically controlled moving platforms; and actors playing themselves while unaware of it: music or sounds of the city, the woods, inside the body and perhaps, outer space.

And, of course, from the engineering point of view, some state of the art equipment, is being developed, much of which may prove to be patentable.

The artists involved in the project include Robert Rauschenberg, perhaps the best and certainly the best-known pop artist; John Cage, composer; Lucinda Childs, dancer; Oyvind Fahlstrom, painter and theatre worker; Alex Hay, dancer and painter; Deborah Hay, dancer; Claes Oldenburg, theatre and painting; Steve Paxton, choreographer and dancer; David Tudor, musician, and Bob Whitman, of the theatre.

Performing Engineers.

The engineers working with the artists as collaborators, will in some cases, actually be performers. All are with BTL, although their work on the Imp festival has been confined to their spare time. Besides Mr. Kluver they include Per Biorn, Cecil Coker, Larry Heiles, Petsr Hirsch, Harold Hodges, Bob Keronski, Cap Lundberg, Jim McGee, Herb Schneider, Tony Trozzolo, Fred Waldhauer, Stretch Winslow, Witt Wittnebert, Richard Wolff, Fred Waldhauer, L. J. Robinson, William Kaminski, Peter Cummiskey, Rudolph Kerl, Kenneth Harsell, and Ralph Flynn.

The festival is being sponsored by about a dozen industrialists, art collectors, publishers and theatrical angels, including Seymour Schweber, of Schweber Electronics.

Environmental System.

One of the most ambitious undertakings by the engineers was the development of TEEM, a theatre electronic environmental modular system which will be used in some manner by all performers.

TEEM will have 10 fm receivers and transmitters, crystal controlled. Either sound of control signals can be transmitted on the fm channels.

A preamplifier with 20-80 db gain has been designed to take any microphone input. Twenty-five of these preamps, which have 4 volts output over 600 ohms, have been made.

In addition, at least 25 power amplifiers, each of which will give 20 watts power, have been made and are expected to be in steady use during the performances.

The control circuits consists of five channels, using audio-oscillators, triggered by photocells on pushbuttons. The decoding unit has five reed relays and a delay unit. Low power relays are at the output end.

A proportional control system is also part of TEEM. It uses a chassis with 16 photocells. When light moves over the cells, a signal is generated proportional to the amount of light hitting the cell. The signal is thus usable to control the level of a sound, the intensity of a light, or the speed of a motor. The 16 control signals can be taped or sent via a wireless system.

A comermcial unit, the Electrowriter is attached to TEEM, as well as 10 tone control boxes, a patchboard to use as a mixer in connection with the preamplifiers, and a drum selector switch for programming.

In addition to TEEM, most artists will have other equipment for their special needs. Mr Rauschenberg, for example, will have an infrared TV set as part of his contribution.

Art Experience.

Many of the engineers have done some work with artists in the past. Mr. Kluver's has worked previously with Rauschenberg, Cage, Andy Warhol, Jasper Johns and Jean Tinguely.

For Tingeley, Mr. Kluver and his technical assistant at the time, Harold Hodges, collected and assembled the bicycle wheels, motor parts and tubing for the well-publicized self-destroying machine which wheeled and putted and groaned briefly at the Museum of Modern Art before collapsing to its own planned demise.

In a collaboration with Rauschenberg on the "Oracle," Kluver supplied the sound for the five sculptures in the group. The final system enabled sound to be heard from each of the five pieces with each of the radios controlled from a central unit in one of the sculptures.

The Armory has been leased Oct. 8-24. Opening performance of the IMP festival probably will be about Oct. 13.

NEW YORK MAGAZINE WORLD JOURNAL TRIBUNE, OCTOBER 2, 1966

Art Meets Technology

by John Gruen

The scene is positively sinister. Cars silently drive up, stop and disgorge men and women carrying weird scientific objects, oddly shaped bulbs, coils upon coils of wire, electronic boards, batteries of lights, whole armies of portable electronic amplifiers, equalizers, transmitters, receivers, distand control equipment and proportional control equipment.

They are bringing these things into a huge high school gymnasium somewhere in darkest New Jersey. Now they are setting up. Cords are plugged in, dials are turned, switches are flicked, wires are joined and soon the place is alive with the tense, mysterious hum of electronics. Computers start computing. Lights go on and off. A cacophony of bizarre sounds assail the ear like so many threatening signals. The whole thing resembles a summit meeting of SMERSH.

What is perpetrated here is a plot—a plot designed to change the course of art completely. The men and women so intently at work here are a group of artists and engineers deliberately joining forces to make the plot become a reality. Their aim is to start a revolution, to overthrow old concepts, to reach into the unknown and to produce art works that will combine the most advanced technological discoveries with the most daring, the most outrageous creative ideas an artist may be capable of dreaming up.

What they are up to will be made public in an unprecedented series of events to be held from Oct. 13 to Oct. 23 at the 69th Regiment Armory, 25th Street and Lexington Ave. Called *Nine Evenings: Theater and Engineering*, the programs are an attempt to fuse music, painting, dance, film, television and advanced technology into an organic, visually and esthetically stimulating whole.

This disquieting union has the partial blessing of Bell Telephone Laboratories which has permitted 30 of its engineers to take part in this project—*in their spare time only*. The team is headed by Billy Kluver of the Physical Optics and Electronics Research Department. Kluver, long active in solving complex technological problems for artists (Tinguely, Johns, Warhol, etc.), is convinced that beauty is no longer the domain of art—that, in fact, it can best be produced by the phenomena of technology. But he is quick to add that the artist is a visionary about life and, as such, able to help illustrate the full uses of technology.

As for the artists involved in the presentation, they welcome technology with open arms, elated over the immeasurable creative possibilities open to them. In point of fact, the nine participating artists have, themselves, been part of a movement that has consistently questioned all areas of the creative act and experience. They have calculatedly employed cinema, music, theater and dance to shatter the habitual and the predictable.

The new manner in which these artists are billing themselves is yet another indication of how the arts are slowly but surely merging: Robert Rauschenberg, painter-choreographer; John Cage, composer-writer; David Tudor, musician; Lucinda Childs, Deborah Hay, Steve Paxton, choreographers-dancers; Alex Hay, painter-choreographer; Oyvind Fahlstrom, painter-playwright; Robert Whitman, sculptor-film maker.

The chilling scenes taking place in that New Jersey high school gymnasium were tests and rehearsals for the forthcoming New York performances. Each artist worked with two or three engineers. They poured over complex charts that indicated the workings of computer systems. They discussed frequencies, circuits and electronic boards. They manipulated hundreds of wires and observed the results of remote control sound and color devices. It was a lesson in incongruity—the young rebellious artist paying strictest attention to the highly skilled, experienced voices of engineers.

Billy Kluver hovered over everything and everyone. His alert blue eyes missed not a single detail of the proceedings—and there was satisfaction in what he was accomplishing. "Traditionally," he explained, "functional rules simply don't exist for the artist. He discovers the rules and how to use the materials as he goes along. His work is essentially instantaneous and he will rarely commit himself to future restrictions.

"The engineer, on the other hand, is theoretical. He knows what he is doing, why he is doing it, and what the function of his work is. He works logically within a framework.

"In his role as consultant to the artists, the engineer provides the technical unit the artist's idea feasible and may, in fact, p item in his contribution to the art work.

Bob Rauschenberg agrees. "Workin neers is inspiring. I could not do what without them. It is no longer possible whole area of technology. We have no example, that buildings will have wa longer. I can foresee art schools giv climate. I can foresee art schools giv electronics and vacuum moul lings. W to wait. We must force a relationship ogy in order to continue, and we must The most positive thing I can say is t does not lead us back into history—hu into the unknown."

Among the spectacles to be offered Rauschenberg's compositions promise to incredible a new meaning. To begin w sembled a cast of 300 to 500 people. I of the work opens with a simple tenn the rackets are equipped with small tra contact mikes. As the tennis ball bou racket to the other, vast bell-like sound At the same time, the lights that illumi begin to go off. The "sound" of the the lighting system, and the game is c place is in total darkness.

At this point, the hall is lit with which makes it seem as though it were st darkness. Now the audience can only v activity is taking place on large screen infra-red TV is projected. It is here th berg's cast of hundreds will be engaged choreographed dance. The "music" that it will be the great bell-like sounds hear tennis match—this time emanating from placed amplifiers.

"I hope in this piece to set up some tween audience and performers," says Rau "I want the audience to sense the live prese cast, but I wish it to see the performance duction only, via the TV screens. I want t the audience's habitual response to live perfo I wish to present them with a set of sensory i

The presentation to be offered by danc



Artists Robert Rauschenberg and Lucinda Childs (second and third from left) discuss technical capabilities of new electronic environmental system with engineers Herb Schneider, L. J. Robinson, Per Biorn and Billy Kluver.

". . . The point of it all is to find new means of expanding the sensibilities of everyone concerned—the artist, the engineer and the audience . . ."

NEW YORK MAGAZINE WORLD J

NEW YORK TIMES, OCTO

Art Notes

The Sounds That

By GRACE GLUECK

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gineer provides the technical unit that makes the artist's idea feasible and may, in fact, be an original item in his contributon to the art work."

Bob Rauschenberg agrees. "Working with engineers is inspiring. I could not do what I want to do without them. It is no longer possible to by-pass the whole area of technology. We have no assurance, for example, that buildings will have walls for much longer. Artists should be the first to sense this sort of climate. I can foresee art schools giving courses in electronics and vacuum moul lings. We can't afford to wait. We must force a relationship with technology in order to continue, and we must move quickly. The most positive thing I can say is that technology does not lead us back into history—but advances us into the unknown."

Among the spectacles to be offered at the Armory, Rauschenberg's compositions promise to give the word incredible a new meaning. To begin with, he has assembled a cast of 300 to 500 people. However, Part I of the work opens with a simple tennis-match. But the rackets are equipped with small transmitters and contact mikes. As the tennis ball bounces from one racket to the other, vast bell-like sounds are emitted. At the same time, the lights that illuminate the scene begin to go off. The "sound" of the game controls the lighting system, and the game is over when the place is in total darkness.

At this point, the hall is lit with infra-red rays which makes it *seem* as though it were still in complete darkness. Now the audience can only view whatever activity is taking place on large screens upon which infra-red TV is projected. It is here that Rauschenberg's cast of hundreds will be engaged in a strange, chorcographed dance. The "music" that accompanies it will be the great bell-like sounds heard during the tennis match—this time emanating from 10 variously placed amplifiers.

"I hope in this piece to set up some tension between audience and performers," says Rauschenberg. "I want the audience to *sense* the live presence of the cast, but I wish it to *see* the performance in *reproduction only*, via the TV screens. I want to destroy the audience's habitual response to live performances. I wish to present them with a set of *sensory illusions*."

The presentation to be offered by dancer-choreographer Lucinda Childs will be equally arresting. A six-foot-high plexiglass box containing a lone dancer will be made to float on air. Its movements will be controlled by the dancer inside, and the lights, as well as the sounds, will be automated by a Doppler device which sends out ultrasonic rays. When the floating box, as well as a number of un-enclosed dancers move through the rays, sounds are emitted, and lights begin to go on or off.

Oyvind Fahlstrom's composition will involve a mechanized pillow-fight, in which sounds will actually be "thrown" through space. Working with film-prop expert Alfonse Schilling as well as with computers, the presentation will also include a sea of infra-red-lighted cotton which will be made to do strange, unexpected things.

An environmental work by choreographer-dancer Deborah Hay will include eight movable platforms holding two dancers each. The platforms will be operated by the performers themselves. The dancers will be clad in costumes of white, shiny materials and no less than 30 floodlights will be made to shine on them. Tapes will produce the sounds made by volcanic rocks that have a special resonance, collected on an island in Japan by composer Toshi Ichiyanagi. A proportional control system, devised by engineer Fred Waldhauer, will be operated by Deborah Hay.

Painter-choreographer Alex Hay will perform a dance to the accompaniment of the sounds made by his own body. This will be made feasible by his wearing a small, yet powerful amplifier that Bell engineers have invented for the occasion.

John Cage plans to pipe-in natural street sounds, sounds coming from a far-off kitchen, and other distant, disparate places. These sounds will form a composition to be mixed and concretized in the Armory hall itself, in the presence of the audience. The piping-in system is yet another engineering feat not before attempted.

The evening featuring the work of dancer-choreographer Yvonne Rainer will offer a two-part performance which will go on simultaneously. The first will employ live performers engaged in lifting and putting down rectangular objects of various densities. Their actions will be controlled by way of walkie-talkies strapped to each performer. The second section is entirely automated. Film fragments, light-changes, taped dialogue and various chemical occurrences will be activated via a centrally controlled system, predetermined and operated by Miss Rainer.

There is no question that *Nine Evenings: Theater and Engineering* will prove a landmark of sorts. The point of it all is to find new means of expanding the sensibilities of everyone concerned—the artist, the engineer and the audience.

"We are only scratching the surface," says L. J. Robinson, the systems coordinator of the project. There are uncharted worlds yet to be discovered—technological worlds that could totally change the face of theater as we know it. I can envision a totally automated theatrical performance where by the mere pushing of a button a sequential series of events could be activated—from the initial rising of the curtain to the final dimming of the house lights—a computerized theater which would allow directors, scenic designers and actors to work with systems of undreamed-of maneuverability. I am convinced that in the not-too-far-distant future we will have cross-country theatrical research centers that will aid in fulfilling the requirements of imaginative artists everywhere."

A notable step in this direction is the first electronic environmental system which engineer Robinson has perfected for the *Nine Evenings*. Called THEME (Theater Environmental Modular Electronic), the system is the most ambitious of the technical projects to be put into use by artists. It was designed to fill the special requirement of the scheduled events, and it is a small masterpiece of electronic invention. Another significant contribution is an electronic dimmer board which is activated by a light moving across it.

"From now on, the magic of the theater will take on unbelievable new dimensions," said Bob Rauschenberg. After musing on this for a moment he added, "You know, I was talking to my young son the other day, and I asked him about school. I wondered which subjects were his favorites New Math and Physics, he replied. Then it occurred to me that my son might not, as may be assumed, turn out to be a scientist, but an artist. It occurred to me that mathematics and physics might indeed be the requirements of becoming the artist of tomorrow."

Art Notes

The Sounds That Mushrooms Make

By GRACE GLUECK

PUT artists and engineers together in this programmed age, and what do they spawn? A festival. "A dynamic fusion of painting, dance, film, television and advanced technology," sings the press release that heralds "Nine Evenings: Theater and Engineering," the plugged-in extravaganza that opens next week (October 13) at the 69th Regiment Armory.

"But we're not concerned with flashing lights and psychedelic effects," says coordinator Billy Klüver, a Physical Optics and Electronics Research man at Bell Telephone Laboratories, and a longtime art world collaborationist. "We hope simply to convey an idea of the cooperative possibilities of art and technology, to show how artists are using technology as material."

Bongs, Beeps

Sure enough, at festival rehearsals in the gym of a Berkeley Heights, N. J., school last week, the air was thick with rapport. Per Biorn, a Bell Labs engineer, had dancer Lucinda Childs whirling—in a ground effects machine that glided on a cushion of air. Artist Robert Rauschenberg played tennis with Bell's Bill Kamanski, both wielding sound-wired rackets that broadcast the bong of the ball. And musician-mycologist John Cage probed with technicians such delicate questions as how to pick up the sound of a mushroom producing spores. ("Mushrooms are making sounds and we should be listening to them," Cage was saying.)

The festival is the product of months of fine tuning between two groups who'd normally only make static together: 10 dancers, painters and musicians, and some 30 Bell Telephone engineers (working on moonlight, not company, time). It was conceived last winter as an American contribution to the Stockholm Festival for Art and Technology, organized by the Swedish Modern Music Society to salute technology's impact on the arts.

When lack of funds forced Stockholm to call off its invitation last July, the Americans decided to keep the show alive. Where to hold it? The Armory at 25th St. and Lexington Ave., of course, scene of the landmark Armory show of 1913. With a boost from such local backers as the Last Foundation and electronics tycoon Lester Avnet, Klüver & Co. set to work. The primary job to learn a mutual language had begun last January in a series of artist-engineer bull sessions that went on for three months.

"At first we were nowhere," recalls a participant engineer. "I had the feeling we were talking underwater. The artists couldn't verbalize in scientific terms, and we couldn't get through to them. But gradually, we started to hear each other."

At that point, projects began to stir. To help Happener Robert Whitman (who works with film and live TV projections) realize his notion of taking a picture simply by waving his hand, engineer L. J. Robinson delved into fiber optics, taped a lens on Whitman's palm that was connected to a camera harnessed in his sleeve. For his 9-part theater piece, "Kisses Sweeter Than Wine," artist Oyvind Fahlstrom wanted a moving sound source that could be tossed around; engineer Peter Hirsch obliged with an electronic "sound ball" thoroughly cushioned by bouncy metal springs. Dancer Debbie Hay choreographed a dance that called for performers to glide through space. Engineers Larry Heilos and W. Wittnebert solved that one with 8 wheeled platforms, remotely controlled, that look like surreal displacements of the floor.

Casting about to fill the artists' bills, Bell technicians have come up with some items of hot commercial appeal. The festival's technical core, for example, developed entirely by Bell engineers, is an automated backstage theatrical control system that already has more conventional theater technicians drooling enviously.

Pocket-Sized Sound

Another breakthrough is a tiny, pocket-size amplifier with a staggering output of 20 watts. "It frees the artist — he's no longer tied to big sound boxes, he can roam around," points out Robinson, who'll monitor the system at the festival.

But neither group is worried about how the effects will come off, nor even whether things go very well. "The big thing is that we've done it for the first time, artists and engineers have worked together," says Robinson. "I never knew any artists before this, and I've learned to think in an entirely different dimension. No one's ever before drawn out of me the time, labor and thought that they did."

"It's a new kind of mix, an exchange of attitudes," says dancer Steve Paxton. "The freshness of the situation is terrific. Everyone's worked very hard—there's a kind of innocent goodwill. And there's probably more to come."

Coordinator Klüver hopes so. Right now, he is working on plans for a permanent foundation, that might work with industry. Purpose: to set up stores and service where artists could have access to far-out materials, the advice of good technicia



William Rivelli

TRIO—Dancers Alex Hay and Lucinda Childs waltz with a ground effects machine. An air cushion keeps it hovering ever so slightly off the floor.

COLLAGE

Art critic Harold Rosenberg, author of last year's "The Anxious Object," has been named to the Committee on Social Thought at the University of Chicago . . . Octogenarian Oskar Kokoschka himself will come here from Switzerland to attend the gala opening of the exhibition, "Oskar Kokoschka—An Eightieth Birthday Tribute" October 18 at the Marlborough-Gerson Gallery . . . Fashion note: At the Wadsworth Atheneum's annual Museum Ball October 22, "prominent committee women and wives of trustees" will turn up in paper dresses. Alas! the dear old Wadsworth is tying in with a textile promotion . . . Philadelphia's Durable Dish Co. is marketing a set of black and white china designed by Popster Roy Lichtenstein — an adaptation of his recent stacked dish sculpture. "For dejeuner sur l'herbe . . . dinner before the vernissage . . . or breakfast after the Happening," touts a Durable flyer. Price? $50 per place setting. Philadelphia's Institute of Contemporary Arts' Great London Art Tour, a 10-day swing through the switched-on city, leaves Philadelphia Dec. 2, returns on the 12th. Fare, $233. On view, says a release: private collections, leading artists and collectors, distinguished London galleries, Live Painters

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ELECTRONIC NEWS, October 17, 1966

ENGINEERING GOES TO THE THEATRE

NEW YORK. — Alex Hay, the artist, walked out in the 69th Regiment Armory Thursday night with packs of sensors taped to his chest, heart and face and proceeded to sod a pink, skin-colored "grass" turf with all the stolidity of Millet's stunned peasant.

His clothes were the same color, down to his sneakers. He moved at a slow, steady pace with machine-like precision, the sound of his exertion — the brain waves, muscle movements, eye movement, — amplified at a central control station and distributed over a loudspeaker in a grating rasp.

When he completed his job of placing 100 squares of pink square duck canvas on the floor, artists Steve Paxton and Robert Rauschenberg emerged and unsodded the field, while Hay sat down in front of a TV camera, which flashed his sub-human image on a black-and-white screen in background.

This was one of the works presented at the opening of "Nine Evenings: Theatre and Engineering," a collaboration between a number of of experimental artists and Bell Telephone Laboratories engineers who were working on their own time.

Watching Mr. Hay, one could imagine a panel of doctors examining his responses with the same mechanical indifference that he exhibited. He had created a portrait of a human guinea pig in a world peopled by them and it was disturbing.

It was as though the characters in the German post-World War I school of painting, the Neue Sachlichkeit, had come to life through the Hay's conception and the engineering assist of Herb Schneider.

Space Dance.

Another feature in the opening night's performance was the space dance by Deborah Hay, "Solo," in which a somber "orchestra" seated at the side lines, performed soundlessly with their instruments — eight remote control panels—while a conductor waved them on, in a world of electronics developed by engineer Larry Heiles.

Sixteen dancers in white costumes danced at slow, measured cadences, on the floor, and on slowly moving remote controlled boxes, as intense light bounced off their costumes. Motion pictures have tried to portray a space dance a number of times — usually in nightmare scenes — and always with less success.

These were two of contributions in Nine Evenings which were interesting, moving and successful. Not all went well with the opening. The entrance of the audience was part of the show in a concept conceived by Steve Paxton and engineered by Dick Wolff. The audience was ushered through a plastic tunnel, replete with unfamiliar sounds, projected lights and color slides.

The engineers were late in inflating the tunnel, with the result that early arrivals had to mill outside in the corriders almost an hour. It may have occurred to others, too, that they were attending a non-happening with excursions into boredom and fatigue in pursuit of a new aesthetic. This situation, it is expected, will be corrected when Paxton's work is presented again.

Engineering Beauty.

At the opening, the engineering was beautiful and the performers functional. (No, Miss Hay is beautiful and functional and so talented she probably made her space dance more attractive than intended.) One wished though, that the engineers had borrowed a leaf from the trade shows and installed a booth where the audience could go to pay homage to the equipment by asking questions and perhaps filling in an inquiry card.

Also, it seemed, what is needed is a revolving stage so that there would be fewer long waits. What if the production cost a million when the human engineering factor is at stake? As it is, to see the entire production, one must drop in for five different evenings. It may be worth it since you'll find something different and exciting if you can bear the prolonged wait between performances.

The list of credits is enormous. The names of Seymour Schweber, Lester Avnet, Federated Electronics, Amp, Inc., are among those known in electronics which come to mind readily.

— Nat Snyderman

VOGUE

BY BARBARA ROSE

"burst of futuristic thinking"

The conviction that the Machine Age demanded a new kind of art geared to scientific progress has animated many artists in the twentieth century, beginning with the Italian Futurists, who were ready to jettison all past art in their pursuit of an art of the future. Today, we are witnessing another burst of what I would call "futuristic" thinking in art. Painters and sculptors are devoting more time and energy to experimenting with new techniques and new materials than they have since the Bauhaus (1919-1933) in Germany. New pigments—acrylic, fluorescent, and metallic—are being investigated by abstract colour painters like Olitski, Noland, and Stella, to name three of the most important who have had recent New York City shows.

At the same time young sculptors are considering new materials and techniques of construction which allow them to achieve complex effects like the optical shimmer of Larry Bell's radiant glass boxes. Such others as Donald Judd, Robert Murray, and Robert Morris, whose clean straightforward works outshone everything except the superb Anthony Caro at the "Guggenheim International Exhibition," are working with commercial fabricators to achieve effects unavailable to hand-constructed sculpture. Still others, like Robert Whitman, whose laser-beam environments at The Pace Gallery were a cut above conventional light art in inventiveness, are proposing a new union of art and science.

The remarriage of these Two Cultures, which have been more or less divorced since the Renaissance, is largely what is behind E.A.T. (Experiments in Art and Technology), a joint venture of artists and scientists which is the brainchild of painter Robert Rauschenberg and engineer Billy Kluver of the Bell Telephone Laboratories. These developments lead us to question what kind of results we can expect from such a merger. If last year's theatrical debacle *Nine Evenings: Theatre and Engineering* is any indication, the answer is a lot of confusion. The main criticism of such ventures is that they seek to put in a public context what had been private and highly personal statements.

Thus, what succeeded in the intimacy of New York's Judson Memorial Church with its devoted coterie audience was bound to fall flat in the vastness of the Armory in front of an audience that came basically to be entertained. Despite the Armory flop, however, I think the real possibilities of a marriage between art and technology lie in the area of mixed-media theatre events.

In painting and sculpture, on the other hand, scientistic thinking can only result in a dry intellectual art. "Science is a mine for technique," Donald Judd has said. That about sums up what I think should be the proper attitude toward technology for painters and sculptors, who finally must fall back on inspiration and intuition if they are to produce an art of any lasting value or real originality. The problem at present—and it is widespread—is a confusion between means and ends. When technique—either in materials or in refinement of execution and craft—becomes *an end in itself*, art suffers or disappears. It is tempting, of course, to speculate on the form the future will take, especially for artists who are the most farsighted-looking individuals in a culture. But the art of the future can not be rushed or anticipated; it must evolve naturally out of the art of the present.

ART INTERNATIONAL, JANUARY 20, 1967

TOTAL THEATRE?

LUCY R. LIPPARD

The latest and most expensive in a long line of tentatives toward a union of art and science was *Nine Evenings: Theatre and Engineering* at the 25th Street Armory in New York. Its extensive and often exaggerated publicity promised much and delivered less, disillusioned many and enlightened some as to the real and great problems of realizing the intermedia revolution, with or without the would-be helping hand of science. The collaborative effort of ten artists (painters, dancers, musicians) and some thirty volunteer engineers from Bell Laboratories, under the rather starry-eyed aegis of Billy Kluver, *Nine Evenings* consisted of ten individual pieces, one by each artist: Robert Rauschenberg, David Tudor, John Cage, Yvonne Rainer, Steve Paxton, Robert Whitman, Oyvind Fahlstrom, Alex Hay, Deborah Hay, Lucinda Childs.[1] This was not just another light and music show. It was not entertainment or education or mind-expansion. It was a serious attempt by ten respected artists to make use of the most advanced technology within the context of their own advanced sensibilities, and it represented over nine months of intensive work and planning. All of the artists had had some experience with the performing arts; though far from the first to enter the field, they were better endowed than most and they entered it largely as theatrical amateurs. The reasons that the results compared unfavorably with many less artistically and financially privileged precedents are complicated, and will continue to be illuminated as the post-mortems pile up.

Before I begin to complain, I must qualify my complaints and note that at least six of the pieces performed were well worth the trouble and were even, at moments, memorable. Perhaps it is querulous of me to demand more, but while *Nine Evenings* had its high points, as a trial case for experimental or "synergetic" theatre on a large scale it was less satisfactory. My basic complaints are three: first, the engineering defects, which were more conspicuous than the artistic, an unexpected turn of the art-science syndrome; second, artists, engineers and coordinators bit off more than they could possibly have hoped to chew; third, and most fundamental, the approach was not radical enough.

It may be unfair to criticize the artists on the basis of technical failures which were ultimately not their fault, but on the other hand, a professional performance is a professional performance. Rehearsals are rehearsals and not first nights. The best of the experimental arts are not experiment for experiment's sake but the essence distilled from experiment. Departure from the known is not enough, and incoherence often passes for radical innovation even when it is by nature timid and conservative. Given the high quality of previous work by the same people, the departures in *Nine Evenings* were superficial rather than fundamental. I do not mean that the artists should have changed their styles or viewpoints, but that given the space, the scale, the equipment, they should have expanded them. There was very little attempted at the Armory that could not, finally, have been done at Judson Church, or in a parking lot.

Surely at some point in the nine-months gestation period, someone involved realized the naiveté of beginning such an unprecedented collaboration on such a grandiose scale. In addition, the capacity of the engineers to visualize and fulfill the artists' demands was obviously misjudged, and there was too much respect for artistic license, too little for professionalism in terms of the performing arts. What was patently lacking was a strong, professional hand guiding all aspects of the undertaking. Mr. Kluver, an engineer himself, is to be admired for his faith and his energy, but his role seems to have been less director than chaplain. The dose of technology was simply too great. Engineering is not an art; it can be useful to the arts if taken with discretion. The collaboration in *Nine Evenings* may have been too "equal". I can well imagine how hard it was for the engineers to put up with the artists' changeability, but in the end it was the artists who were cheated. They were too often taken in by their "new materials", a phenomenon all too common in current painting and sculpture. The opportunity to use certain technical devices overcame esthetic feasibility, and if all had gone more smoothly, the works of art would have become showcases for technological progress. I enjoyed Fahlstrom's remote-controlled silver vinyl missile zooming around the ceiling (shades of Warhol's pillows), but it had no perceptible logical function (nor illogical magic) in relation to the rest of his piece. And without reading the program one would not have known that the accompaniment to Alex Hay's piece consisted of sounds transmitted by his body, nor that each stroke in Rauschenberg's tennis game regulated the dimming lights. Yet in each case these facts were integral to the conceptual success of the works.

Nor was there any reason to do so many pieces, except perhaps the fact that it is difficult to attract sponsors for a modest endeavour. The participation of fewer artists or more actual collaboration among the chosen group might have made goals of reasonable perfection more attainable. And was it necessary to take on the Armory? It is a fantastic space, to be sure, but hardly the place to try out an already tremendously complicated experiment.[2] The strictly practical problems of rigging a temporary installation for all that equipment in such a huge area would have fazed the most experienced director, and strictly practical problems engaged neither the artists nor the engineers. Such mundane items as malfunctioning slide projectors, public address and closed-circuit television systems were apparently beneath the attention of advanced scientists.

Since there were no theatre people involved, it may be a mistake to look to this sort of performance for the seeds of a new theatre, but in view of the dilemma in which the real or verbal theatre finds itself today, such innovation is not altogether impossible. A new theatre might well begin as a non-verbal phenomenon and work back toward words from a different angle. Departing from Samuel Beckett's highly verbal, single-image emphasis, it could move into an area of perceptual experience alone, its tools a more primitive use of sight and non-linguistic sound. Such a theatre would not necessarily be the amorphous carnival of psychedelic fame but could be as rigorously controlled as any other. One of the more disappointing aspects of the Armory events was that innovations either wrought by or indicated by Happenings and their various offshoots were not extended, though many of the conventions of Happenings persisted in *Nine Evenings:* the collage image, vinyl or cloth-wrapped people, objects, or cars, and a fondness for mirrors and translucent plastics as media of transformation —ethereal masks or screens that force re-examination of forms and events. Except in the Cage (second night) and the Paxton pieces, audience was strictly separated from performers. Though these artists have performed before in a great variety of spaces, and the Armory should not have overwhelmed them, the audience was lined up in bleachers and balconies in an impractical echo of the conventional theatre. Most of the pieces seemed lost in the vast reaches; the over-frequent use of three large projection screens may have been intended to overcome the spatial barriers, but they usually served only to emphasize the small scale of performers and props and the distance of the bleachers. The use of lighting—a major element in manipulating and changing space—was generally unimaginative, whether from initial conception or technical failure I don't know. (There were distinctive exceptions: Lucinda Childs' piece was all light, vividly if not wholly successfully used, and Rauschenberg's lighting was lively, if not profoundly original.)

Michael Kirby has called Happenings "The Theatre of Effects",[3] and this was the aspect most in evidence at the Armory. Though surpassing the Happenings in esthetic sophistication, many of the performances seemed condemned to be *merely* theatre of effect, since the technological *effect* was so stressed. But a visual theatre need not be just a theatre of effects. The visual element can be fused with other sensuous elements without being simply a foil for insinuated content. In most of the *Nine Evenings*, the various arts were less assimilated into theatre than sidetracked by technology. The result was too often a collage effect even where one was not intended: and an uncontrolled collage is a pastiche. Eight of ten artists used the closed-circuit TV system, usually combined with slides and movies and real action to form a simultaneous *time* collage. Whitman's use of this device is the most evolved, and he blurs the distance between reality and pictured reality by a constant byplay of reflections, repetitions, refractions of action and the action itself. In other works, the effect was distracting rather than dislocating, with a regressive tendency to a random use of images in the acceptable collage or assemblage framework without the indefinable link or absence of links that makes such images convincing. Significantly, the dullest pieces were generally the most technically complicated and "varied", and the best ones were the most controlled.

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Accurate description and evaluation of each piece in the *Nine Evenings* would be too large a task for an article, so I shall continue with statements by the artists, taken from the program *in toto* or excerpted, and followed by brief notes of my own. I have omitted John Cage's *Variation VII* and David Tudor's *Bandoneon!* because I saw them both on the first nights before they were entirely revised and technically operative.

Robert Rauschenberg, *Open Score:*

"*My piece begins with an authentic tennis game with rackets wired for transmission of sound. The sound of the game will control the lights. The game's end is the moment the hall is totally dark. The darkness is illusionary. The hall is flooded with infra-red (so far invisible to the human eye). A modestly choreographed cast of 500 people will enter and be observed and projected by infra-red television on large screens for the audience.*

"*Tennis is movement. Put in the context of theatre it is a formal dance improvisation. The unlikely use of the game to control the lights and to perform as an orchestra interests me. The conflict of not being able to see an event that is taking place right in front of one except through a reproduction is a sort of double exposure of action. A screen of light and a screen of darkness.*"

Rauschenberg's piece improved incredibly the second night when a third section was added to give the piece depth and substance. In it a single spotlight in the dark room picked up the white shape of a girl wrapped in a clothsack; she sang a Spanish song throughout the scene, in a thin, clear, sweet voice that literally pierced the silence. Rauschenberg gravely carried her around, picked her up, put her down again. The visual distinction between the three sections, or acts, was clear and poignant, for the action in the first two sections had also tightened up. The game (between Frank Stella and Mimi Kanarek) speeded up to a brisk and businesslike pace, and during the crowd scene the taped sounds of the tennis game were all that could be heard; the first night each person had spoken his name into a microphone. This resulted in a continuity lacking the first night and made Rauschenberg's piece one of the best, if not the most challenging, of the Evenings.

Robert Whitman, *Two Holes of Water-3:*

"*I am after a work around the stability of a film image and the immediacy of newsflash. The images are concerns—the whole piece makes an image. Television is a great way to collect stuff; besides what's on the air, a camera on anything brings it in live—a local newsflash. Film is a rock solid steady unchangeable record of someone looking at something past.*"

Too complex to describe, the basic image of Whitman's piece was seven vinyl-wrapped cars, which drove silently into place around the floor, and the subsequent (and simultaneous) showing of films, slides, live TV from one corner of the floor and from a mirrored phantasmagoria up in one balcony off to the side, a man

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Oyvind Fahlstrom, *Kisster Steer*

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"On another level my piece deals
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irrelevant images of the Evenings.
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of Bob Hope and Mao Tse-tung
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This was a richly sensuous and visually stimulating environ the audience entered through a series of billowing tunnels, a pressure-filled translucent plastic structure (like a white whale w [illegible] Rauschenberg, spatial vessel). In the tunnels th were a few words to listen, causing them, flashes of trees and amid real grass and trees, a pair of twins wearing experimen into the crowd, a girl painting another girl's face, hands with black (a Magrittean image). Orbits was a tower and by walking around with a little receiver, one picked of recording—talk, music, a love scene, screaming, man discoursing on fishing. To one side was a long clear plastic tunnel filled by a continuous mound with protruding naked elbows, knees or vague perceived—again highly surrealist in effect. Fro the whole complex took on a sculptural aspect erotic flavor of sights seen and heard inside.

Deborah Hay, *Solo:*

"*Solo* is a white, even, clear event in space, of the space and light. They continue the quali environment. All movement is with the intention o of order and evenness.



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watching an ordinary small set below one of the three giant screens. These events connected with difficulty, shattering rather than coalescing the whole, but Whitman's use of images has a crystalline purity. They included a plane winging over an incredible (African?) landscape; reindeer in snow, diving penguins, cattle in brush, a beautiful color film of a girl dressing and undressing (again with that purity of movement), shadows, the red dot of a laser beam, noise, flashing lights. The cars implied funeral cortège as well as drive-in movie, but their real function was that of constant, solid shapes amid the rapid succession of lights, images, experiences. The cars represented the audience and still further separated the real audience from the action. The piece began with very little to look at and proceeded to provide more and more to look at, until the attention jumped wildly from one event to another, or was caught by a single area.

Öyvind Fahlström, *Kisses Sweeter than Wine:*

"*. . . By utilizing our internal broadcasting system, I can have pillows sing out while they are bounced on the floor or thrown in the air. By utilizing our remote control system, I can have an actor pursued by an airborne object or direct the same object to approach floating targets.*

"*On another level my piece deals with machine-like qualities in people: robot-like people capable of memorizing enormous amounts of data or of making multidigit calculations in their heads . . .; the risk of putting 'robots' (narrow minds) in situations for which they are not 'programmed' —i.e. crisis situations—and machines getting out of control. . . . The spectator draws conclusions or not, as he chooses. . . . I think of it as initiation rites for a new medium, Total Theater.*"

Fahlström definitely got, or took, the worst of the art-technology "synthesis". His piece was packed with gimmicks, stretches of pure tedium and, on the positive side, some of the most memorable, if irrelevant images of the Evenings. Among them: a bewigged Rauschenberg on screen and the man himself below (one of a strong group of memory vignettes), a dazzling blonde in silver vinyl slacks and "pasties" descending from the rafters in a rigger's cage after spilling silvery paper and soap flakes into paths of light; a grade B science-fiction movie on robots taking over the world; films of an actually staged street demonstration featuring murals of Bob Hope and Mao Tse-tung which were re-employed in the piece itself; a magnificent red smoke flare which threatened to suffocate the audience into whose face it drifted, but made a lovely light; a girl in a rubber raft filled with jello (but the jello was invisible so the image failed); three wavering serpentine columns of helium-filled soap bubbles from which Tanguy-like biomorphic shapes arose and floated up into the dark; and particularly four people on swings ("sparrows") with long arrow-like feathered sticks projecting from numbered plaques on their backs; they and their screened shadows moving back and forth across dramatically lit space provided a striking sequence, though the overstatement that kept surfacing throughout Fahlström's piece was paramount when they fell off the swings and "died" and someone went around lifting their limp wrists to drive the point home. One slide screen was devoted to typed news items—absolutely illegible, but also absolutely necessary for comprehension of the accompanying events. Conceptually strong parts were consistently unrealized. This was also the only piece to incorporate social comment; a bust of LBJ figured prominently, and uncomplimentarily.

Steve Paxton, *Physical Things:*

"*This piece is a dance with a set. It is cast not only by those chosen as permanent population (for the duration of the piece) but by those who have chosen to see it, and it is presumed that they will observe each other. With regards to air pressure and topography this piece is not an airplane, is pretty much the opposite of an airplane, but much of the rest of it is analogous.*"

This was a richly sensuous and visually stimulating environment; the audience entered through a series of billowing tunnels, a huge pressure-filled translucent plastic structure (like a white whale with dome and de Chiricoesque phallic tower). In the tunnels there were a few events to notice, among them slides of trees and leaves amid real grass and trees, a pair of twins staring expressionlessly into the crowd, a girl painting another girl's face, hands and feet with black (a Magrittean image). Outside was a bower of wires and by walking around with a little receiver, one picked up pockets of recording—talk, music, a love scene, screaming jungle birds, a man discoursing on fishing. To one side was a long dark blue and clear plastic tunnel filled by a continuous mound of black cloth with protruding naked elbows, knees or vague body parts dimly perceived—again highly surrealist in effect. From the grand stand the whole complex took on a sculptural aspect, while retaining the erotic flavor of sights seen and heard inside.

Deborah Hay, *Solo:*

"'*Solo' is a white, even, clear event in space. The performers are part of the space and light. They continue the quality of the area—a white environment. All movement is with the intention of maintaining a balance of order and evenness.*

"'*Solo' is cumulative, gradually accumulating more light, more platforms, more performers, more activity—yet remaining as still and composed as in the beginning . . . Bright lights around the stage area are strongly reflected by the white costumes of the 16 moving performers. The extreme intensity of light bouncing off the costumes modifies the lines of the human body. At times there are no lights. I am interested in creating a middle ground between seeing and not seeing. . . .*"

The statement is to some extent wishful thinking. The light was never so white, the evenness never so striking, but then, Miss Hay was another victim of technological failure, and when I saw this piece only three of eight of her remote control platforms, on which the piece was based, were working correctly. *Solo* proceeded according to game rules, despite its classical guise (the white satin bathing suits and science fiction shorts and shirts); within a certain framework the piece was the performers'; when they wanted to get up on a platform, or get off, or change, they waited for a blackout and did so. Deborah Hay was the most active performer (too active in contrast to the others); the rest varied as to quality. Perhaps because of this, the piece lacked the precision of Rainer's spontaneously programmed actions, and referred more directly to ballet and dance in general. Something didn't quite work out.

Lucinda Childs, *Vehicle:*

"*Vehicle consists of materials animate, inanimate, air-supported (in one instance), which can exist in a non-static state and be observed in increased dimension as they come in contact with light and sound sources made available consistently or intermittedly [sic] by radio signals throughout the dance. . . .*

"*I intend to utilize these devices in a set of circumstances as instruments which may or may not be efficient to the notion of completing anything. I do not feel that dance should be limited to the display of physical exertion alone; anything that can exist in a non-static state for a certain duration of time is of interest to me. My ideas are generally derived from the laws which govern the materials themselves and I attempt to allow the qualities and limitations of materials to be exposed in different situations.*"

The star performer, a transparent booth with Alex Hay in it, was pushed around by another performer (technical failure, I presume) while Childs manipulated a handsome complex of machines that controlled the flashing lights, harsh sounds and a pair of buckets filled with red light, which were the high point of the piece. (They also had something to do with the sound; as they swung from their scaffold it varied.) Everything took place in a relatively small area against a screen. Judging from a highly technical section of her statement, omitted above, there were all kinds of fascinating effects in operation, but the visual result was not as clear. Ironically, concept was blurred by technology and technology by action. Yet this was one piece which attempted to utilize the electronic devices in an entirely new way, and if it wasn't successful, and seemed little related to Childs' accomplished dance pieces, it did move into an area of pure scientism with the daring expected of an art.

Yvonne Rainer, *Carriage Discreteness:*

"*A dance consisting of two separate but parallel (simultaneous) continuities and two separate (but equal) control systems. 1. Performer continuity controlled by me from a remote 'plotting' table where I will spontaneously choose the action and placement of people and objects (from a pre-determined list of possibilities) and communicate these decisions to the 10-odd performers via walkie-talkie. 2. Event continuity to be controlled by TEEM (theatre electronic environment modular system) in its memory capacity. This part will consist of sequential events that will include movie fragments, slide projections, light changes, TV-monitored close-ups of details in the dance-proper, tape-recorded monologues and dialogues, and various photo-chemical phenomena, several involving ultra-violet light.*

"*I have become interested in the idea of effort and in finding precise ways in which effort can be made evident or not.*"

The ten performers wore wrist radios with antennae to catch their commands, transmitted by Rainer from a high balcony overlooking the performance. Uncostumed, aloof, the ten people moved from one point to another, most often one at a time, always walking in a straight line, sometimes over structural objects or bulky rectilinear shapes such as styrofoam beams (lent by Carl Andre), plywood sheets, mattresses, blocks of foam rubber. The movement was unhurried, relaxed (though the tension necessary to listen to the radios belied this somewhat); from time to time the duration of the actions was marked by the occurrence of mock "events". These, often beautiful, single acts included a man descending in a swing from a high rafter, describing an immense arc with the momentum slowly abating over a long period of time, slides, light-changes, a bundle of slats released from mid-air which clattered to the floor, a slide screen toppling section by section, objects moving by themselves, remote controlled sculptural forms moving along the ceiling, taped conversations. Curiously enough the first, or chance, actions described by Rainer above were the most highly disciplined, while those controlled by the electronic coordinator seemed random. The film (Jimmy Cagney, W.C. Fields) and slide images had a rather exotic flavor that counterpointed the wilfully antiflamboyant quality of the performers' actions. This piece, one of the most eventful of the series, was greeted by the rudest audience reception—clapping, stamping, hissing, laughing. The audience's time sense could not be adjusted to that of the work of art. Yet here, and in Alex Hay's piece, the time sense of the work affected the audience in spite of itself, as the rudeness demonstrated. Each minor action seemed so important and so enduring that even the multiplicity of additional effects and constant spatial alterations could not alter the weight of that time. The beauty of this piece lay in its spatial continuity and discontinuity, the precision with which it was conceived and carried out. Despite technical failures, it was one of the best works.

Alex Hay, *Grass Field:*

"*A work built around three elements divided into parts equal in time. . . . 1. Internal sound potentials of the body. 2. External body color. 3. A singular work activity.*

"*The body sounds, example: brain waves, muscle movement, eye movement, will be picked up by differential amplifiers and transmitted to the central control stations by the sound person.*

"*All properties and dress will have the color identity of the skin of the performers.*

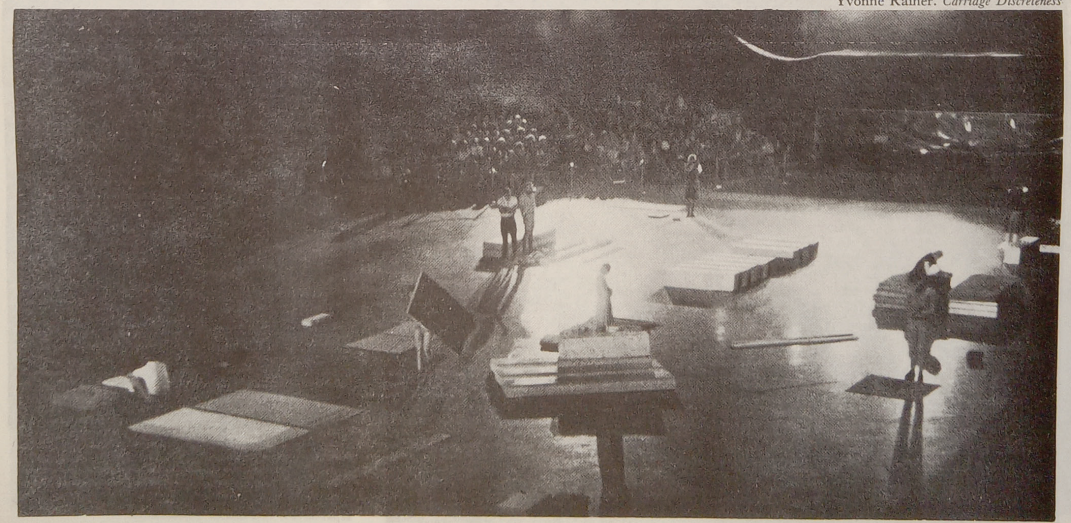
"*The work activity is the random placement of 100 numbered six-foot squares of duck in a ten by ten modular pattern and then retrieved in a correct arithmetic progression and placed centrally. The placement and retrieving of the squares will be a designation of the two parts.*"

Dressed in a very particular color of peach-flesh pyjama suit, with an amplifier on his chest, Hay spent the first period, the longest, taking six-foot squares of the same pink cloth off of a pile, laying them out one by one in regular rows, returning for more, laying them out, etc. Each square had a large fuzzily stenciled number on it.

When the floor was sectioned off into relatively neat rows of pink squares, Hay sat down between two low machines in the center, the lights dimmed, and the huge screen behind him projected a close-up image of his expressionless face, eyes moving, then closed. The electronic sounds accompanying the first period were clearly related to the exterior action performed; the second consisted largely of interior body sounds. Rauschenberg and Paxton came out dressed the same way but without amplifiers, each with a long pole, one on each side of Hay, and picked up the squares in numerical order by pushing the pole under the center of the cloth and bringing it up like a banner, carrying it to the pile, looking for the next number, repeating the action. Paxton was slower than Rauschenberg and their natural movements were quite different. They ended by standing with poles at attention on either side of the recumbent Hay.

It has been possible to describe Hay's piece in its entirety because it was formally coherent and he had the sense to limit himself to one electronic device which (except once) worked. A visual and conceptual whole, *Grass Field* combined clarity and magic without excess comment and frills, provoking consideration of the difference between task and ritual, literal anthropomorphism and its highly abstract ramifications when filtered through scientific procedure, mathematics, and a lightly eerie ambience. It would be a mistake to identify as ritualistic the deadpan but relaxed and single-minded style of the Judson dancers, epitomized by the Hay and Rainer pieces. Without resorting to the quasi-comic exaggeration, stylized rigidity or classical grace of most modern dance, this style achieves an uningratiating, almost athletic matter-of-factness that implies discipline, self-containment and a ruthlessly understated line of action brooking no violence (though exertion is far from precluded). At the same time, it is open to change, to chance, to the performers' idiosyncrasies and awkwardnesses without according them any individual importance. The air of justice that pervaded each movement of the Hay piece and the specificity of the color pink was related to this quality, as well as to the best of structural painting and sculpture, though it would be difficult to pin down similarities aside from the obvious point of the "field". It was, in any case, the best of the *Nine Evenings*.

1. Each piece was performed twice and, as it turned out, the only way to acquire a full picture was to see every performance. The first nights were essentially dress rehearsals, often miserably unsuccessful ones. This couldn't have been predicted when tickets were assigned and I saw three of what I was later told were the best works on their first nights: Cage, Tudor, Rainer. I saw for myself that radical improvements could be made when I saw the Rauschenberg both nights.
2. Of course the avant-garde is not unique in its practical incapacities. The Metropolitan Opera's lavish new quarters at Lincoln Center has had continuous snafus; intermission time was recently tripled because a million-dollar gadget got stuck.
3. Michael Kirby, *Happenings*, E. P. Dutton, New York, 1965.



Yvonne Rainer. *Carriage Discreteness*

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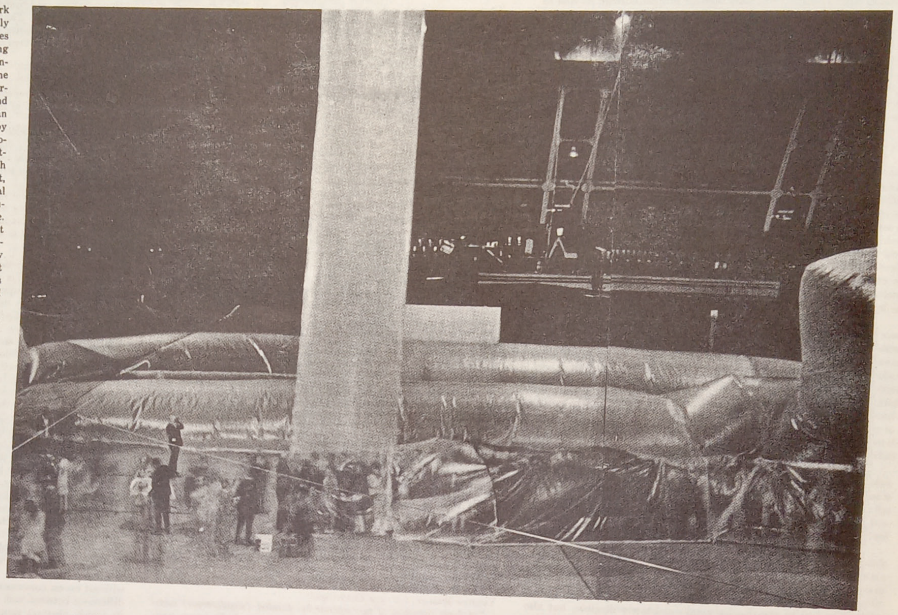
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A WACKY COLLABORATION OF SCIENCE AND ART

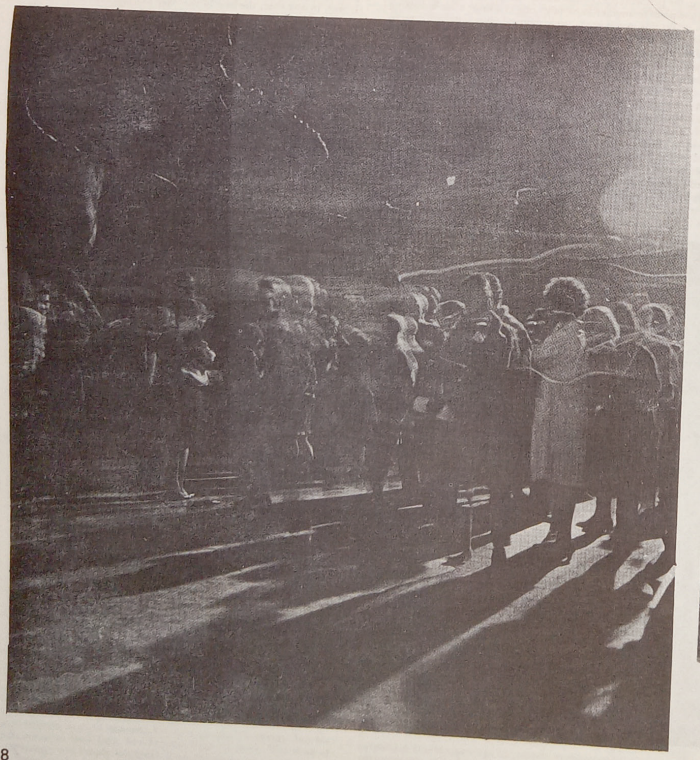
Early last year a band of New York painters, dancers, and musicians warily entered the Bell Telephone Laboratories in Murray Hill, New Jersey. Waiting to meet them was an equally apprehensive group of Bell Labs engineers. The artists had been invited to the laboratories by Billy Klüver, an engineer and physicist who believes that artists can extend their range of expression by harnessing the inventiveness of technologists. Leading the artists was avant-garde painter Robert Rauschenberg, with whom Klüver had worked in the past, turning out mechanical and electrical gadgetry that became a part of Rauschenberg's paintings and sculpture. Now the two men wanted to bring about a large-scale collaboration of the two cultures they represented. Their aim: new forms of art meaningful to a society that —as the two preceding articles in this issue point out—is becoming more and more enmeshed in technology.

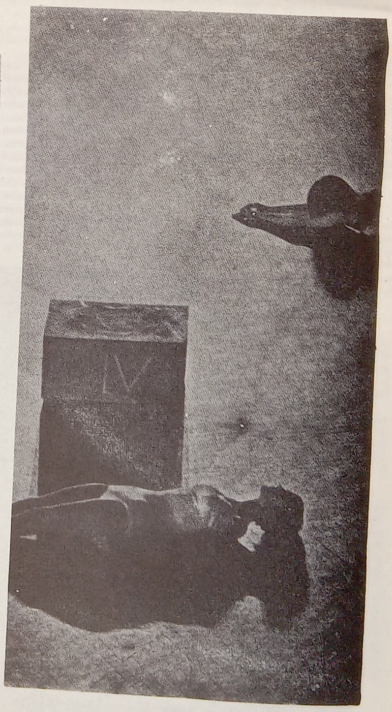
The Bell Labs men asked the artists how technology could help to meet their imaginative needs. The first requests were not modest. One dancer earnestly asked that he be given the ability to fly. Another artist wanted a small piece of cloth that could be stretched to room size. The engineers gulped, but tried to keep in mind Klüver's plea not to discourage the artists. Gradually, they sorted the feasible from the unfeasible and, after several group meetings, the engineers worked on their own time to come up with a mix of artful devices, including a toy airship that flies about under remote control and tennis rackets that set off great *bongs* when struck by a ball.

Last October, on the spacious floor of a Manhattan armory, the group presented *Nine Evenings: Theatre and Engineering*, a series of performances of dance, music, and drama. Some 10,000 people attended; examples of what they saw, heard, and did are shown here and overleaf. By and large New York art critics were bewildered. But the artists are now happily dreaming up new demands on technology. And the engineers are ready to try it again even though most of them admit that they really didn't understand the first performances.



A flabbily inflated, 500-foot-long plastic tunnel inside the armory led spectators along a zigzag tour in which their senses were assailed by flashing lights, projected images, and such sights as girls whose skins shimmered with mysterious colors. The vertical tube rising from the center of the tunnel towered upward to the armory's 100-foot ceiling.





Sixteen people and eight boxlike moving platforms performed in Deborah Hay's highly effective ballet, *Solo*. At times the people danced on top of the boxes; at other times the people and the radio-controlled boxes moved in separate but coordinated patterns.

JOURNAL DE LETRA

A E.A
—uma aliança
e a arte

Os sociólogos da arte proclamam que é erróneo persistir em que a maioria das modificações a que está submetida a vida social, e juntamente com ela a arte, se sucedem baseando-se na livre vontade humana. Este princípio ajusta-se perfeitamente às relações da arte com o progresso. Sem deixar de admitir que a determinação de procurar caminhos fixos para a arte, a fim de não ameaçar a sua unidade, como recela o sociólogo A. Gehlen, tem o seu peso, não podemos, por outro lado, esquecer a propensão que sempre existiu de integrar a arte na evolução da vida social no que se refere particularmente ao aproveitamento das conquistas materiais, por parte dos artistas. HÁ, no entanto que ressalvar que o estado das implicações sociológicas da arte não serve, como sublinha A. Silbermann, para esclarecer a sua natureza e a sua essência.

Podemos ver através da aplicação de todo um vasto arsenal usado pelos artistas como tem sido lenta e por vezes relutante a adaptação de novos meios fornecidos por outros sectores da actividade humana, a política, a indústria, a técnica.

Um movimento que propõe a conciliação dos dois mundos, o da ciência e o da arte, acaba de se iniciar nos Estados Unidos sob a sigla de E. A. T. (Experiments in Art and Technology) em moldes de completo acordo mútuo, numa total determinação e sem dúvida obediente a um espírito de antecipação, no qual estão empenhados artistas e homens de ciência.

A organização E. A. T. fundada em 1966, tornou possível pela primeira vez, delinear um programa

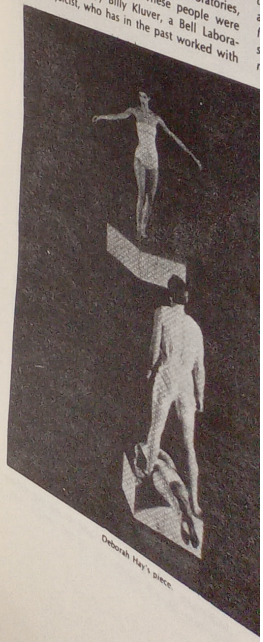
ART FORUM, FEBRUARY 1967

SIMONE WHITMAN

The project, begun in January, was to be the American contribution to the Stockholm Festival for Art and Technology which took place in mid-September. But by October, after ten months of development, it emerged as a series of performances at the 69th Regiment Armory in New York, the same building which housed the famous "Armory Show" of 1913. It was the showing of the [illegible] between [illegible] engineers.

Originally, the Swedish organization which had invited ten American artists was going to supply, in addition to artists' fees and travel expenses, $10,000 for the making of equipment. The artists themselves raised $5,000 more from American sponsors.

The artists involved were John Cage, composer; Lucinda Childs, dancer and choreographer; Öyvind Fahlstrom, painter and author of theatre pieces; Alex Hay, painter and choreographer; Deborah Hay, dancer and choreographer; Steve Paxton, dancer and choreographer; Yvonne Rainer, dancer and choreographer; Robert Rauschenberg, painter and choreographer; David Tudor, musician and composer; R. Whitman, author of theatre pieces. The engineers, most of whom were from Bell Telephone Laboratories, worked on their own time. These people were brought together by Billy Kluver, a Bell Laboratories physicist, who has in the past worked with



Deborah Hay's piece.

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A E.A.T.

— uma aliança entre a ciência e a arte de vanguarda

por Manuel de Lima

Os sociólogos da arte proclamam que é erróneo persistir em que a maioria das modificações a que está submetida a vida social, e juntamente com ela a arte, se sucedem baseando-se na livre vontade humana. Este princípio ajusta-se perfeitamente às relações da arte com o progresso. Sem deixar de admitir que a determinação de procurar caminhos fixos para a arte, a fim de não ameaçar a sua unidade, como receia o sociólogo A. Gehlen, tem o seu peso, não podemos, por outro lado, esquecer a propensão que sempre existiu de integrar a arte na evolução da vida social no que se refere particularmente ao aproveitamento das conquistas materiais, por parte dos artistas. Há, no entanto que ressalvar que o estado das implicações sociológicas da arte não serve, como sublinha A. Silbermann, para esclarecer a sua natureza e a sua essência.

Podemos ver através da aplicação de todo um vasto arsenal usado pelos artistas como tem sido lenta e por vezes relutante a adaptação de novos meios fornecidos por outros sectores da actividade humana, a política, a indústria, a técnica.

Um movimento que propõe a conciliação dos dois mundos, o da ciência e o da arte, acaba de se iniciar nos Estados Unidos sob a sigla de E. A. T. (Experiments in Art and Technology) em moldes de completo acordo mútuo, numa total determinação e sem dúvida obediente a um espírito de antecipação, no qual estão empenhados artistas e homens de ciência.

A organização E. A. T. fundada em 1966, tornou possível pela primeira vez, delinear um programa no qual se visa estabelecer a aproximação entre a comunidade industrial e a comunidade artística.

O principal propósito desta recente organização é estimular a junção dos cientistas profissionais e os engenheiros, com os artistas actuais, estreitar assim a aproximação da comunidade técnica para criar um interesse entre os artistas contemporâneos e a nova tecnologia. A E. A. T. tem como objectivo tornar patente o valor e o significado da contribuição técnica numa obra de arte nas comunidades da técnica e da arte.

O programa desta organização, nas linhas gerais e na divisão dos sectores é assim elaborado:

A INDÚSTRIA deverá manter uma actividade global de suporte a um plano de pesquisas, assim como ao desenvolvimento do laboratórios e organismos de trabalho; promover e traçar projectos em termos materiais e relacionados com a engenharia, e facilitar a sua concretização; apresentar planos tècnicamente exequíveis e alargar as bases de exploração para a indústria; aliciar a participação dos empregados na indústria relativamente às produções que impliquem a colaboração com o engenheiro e o artista.

OS ENGENHEIROS deverão estabelecer uma cooperação positiva de acordo com o papel do artista na sociedade contemporânea; intensificar o reconhecimento nas comunidades da técnica e da arte, a fim de contribuir para a colaboração do artista e do engenheiro.

OS ARTISTAS terão a responsabilidade de estabelecer um contacto rápido e permanente com os engenheiros responsáveis; manter a autonomia e a liberdade de determinação e do carácter estético da sua obra dentro dos limites técnicos, materiais.

Três artistas de renome internacional estão directamente ligados a esta complexa revolução: São eles, o pintor Robert Rauschenberg, o compositor John Cage e o pianista David Tudor.

Numa conferência de Imprensa dada por Rauschenberg na sua residência de Manhattan, o pintor expôs as bases da E. A. T., anunciando o vasto programa proposto. Substancialmente, trata-se de uma salada com «o azeite do técnico, o vinagre do artista, e o sal (com prodigalidade) da indústria». Esta foi a metáfora que Rauschenberg usou para designar uma complexa revolução que envolve hoje não só homens proeminantes da ciência e do mundo da técnica, como artistas de vários domínios e categorias.

A lista dos participantes é já longa. Há artistas famosos e não famosos, grandes e pequenas empresas, cientistas de vários ramos da ciência. Gigantescas empresas como a American Telephone and Telegraph, e a International Business Machines, aderiram a este movimento, ao lado das mais pequenas como a Automatic Springler e a Essex Wire.

Deste modo, a E. A. T. viu aumentar os seus adeptos considerávelmente, sobretudo depois de uma extraordinária série de sessões realizadas o ano passado sob a sigla de *Nine Evenings*. Com a intervenção de um núcleo de artistas de vanguarda e um grupo de cientistas, os *Nine Evenings* provaram ser um dos mais controversos e estimulantes acontecimentos da temporada com manifesto interesse por parte do público que *se fez* representar numa força numérica de dez mil espectadores.

Depois destas primeiras tentativas que tiveram como principais animadores, Robert Rauschenberg e o cientista Billy Kluver, ficou decidido intensificar os trabalhos com vistas a uma mais ampla e, se possível for, permanente colaboração entre o cientista e o artista. Um subsequente *meeting*, cuja finalidade era indagar se havia algum interesse de lado dos artistas no prosseguimento deste programa, deu um resultado decisivo. Trezentos artistas de todos os pontos do mundo, que tomaram conhecimento do debate enviaram respostas declarando-se interessados numa estreita colaboração com os cientistas.

A aliança entre os artistas e os cientistas, sob os auspícios das grandes empresas industriais que a E. A. T. entretanto conseguiu concretizar, entronca no capítulo da sociologia da arte de forma inteiramente activa. É a realização dos designios do artista-sociólogo cujo objectivo principal é nunca separar a arte da sua realidade.

O Museu de Arte Moderna de Nova Iorque convidou a E. A. T. a colaborar na secção dedicada à nova tecnologia na arte para a maior exposição intitulada *A Máquina*, que será realizada no corrente ano. O tema principal, é proposto pelo director do *Moderna Museet*, de Estocolmo, um panorama histórico das interferências da arte na máquina, e reciprocamente. Além disso haverá participação de novos concorrentes que no campo da arte, juntamente com a técnica, deverão enviar os seus trabalhos até ao mês corrente. O número de obras relacionadas com a nova tecnologia serão seleccionadas não indo além de dez. As produções apresentadas devem resultar de uma colaboração entre artistas e engenheiros ou ainda conseguidas por uma só pessoa que disponha de meios para dispensar a participação, conforme o caso, do artista ou do engenheiro. A secção dedicada à nova tecnologia, como o emprego de computadores, novos materiais, electrópicos, e estruturas de engenharia, compreende apenas novas realizações e terão um lugar à parte. Não entram, portanto, no acerto englobado do panorama histórico que se refere ao que anteriormente tem sido objecto do mundo mecânico.

O Museu de Arte Moderna de Nova Iorque abre as portas aos artistas e engenheiros que queiram submeter as suas realizações a uma espécie de competição que poderá avaliar da sua futura projecção. O projecto pode ser arbitrariamente delineado pelo artista ou o engenheiro. O que conta é o resultado da junção de ambos.

O juri é composto por cientistas e engenheiros da comunidade técnica e por artistas da vanguarda.

Uma personalidade de relevo velo dar um grande impulso às iniciativas da E. A. T., o advogado de grande reputação na vida social de Nova Iorque, Theodore Kheel, um mediamoiro entre o trabalho e o ócio, Para este entusiasta perante o programa da E. A. T. os argumentos antecedentes do comportamento do homem-de-trabalho, tem de ser analisado à luz das novas preocupações das grandes massas. Ele entende que os velhos métodos não se aplicam às novas gerações, menos interessadas na produção exarcebada, posto que elas reclamam novas formas de ócio.

Até aos nossos dias, a participação da indústria na arte não excedeu os velhos esquemas do mecenato que não vão além de uma escolha, aliás arbitrária, do que é convencional. Uma das formas mais correntes do mecenato actual é a aceitação do que entretanto se tornou «conhecido» e isso fas com que todas as iniciativas sob os auspícios das grandes empresa nunca passem para além do que já é do conhecimento geral. Pode mesmo dizer-se que as últimas intervenções das grandes empresas, na distribuição de prémios, e outras iniciativas, relacionadas com a cultura, nada têm a ver com o espírito de pesquisa que anima a comunidade da arte. No fim de contas, a intervenção do mecenato, não passa de um aproveitamento para os seus fins próprios, ignorando o que entretanto se elabora à custa da iniciativa particular.

A revolução da E. A. T. reside, portanto, numa estrutura de base, inédita. A E. A. T. propõe a partida para o desconhecido, para o não visto ainda, para o não ouvido. Esta é, na verdade, a mais audaciosa revolução em que as estruturas industriais se têm envolvido até hoje.

SIMONE WHITMAN

THEATER AND ENGINEERING

AN EXPERIMENT

1. Notes by a participant

The project, begun in January, was to be the American contribution to the Stockholm Festival for Art and Technology which took place in mid-September. But by October, after ten months of development, it emerged as a series of performances called 9 Evenings: Theatre and Engineering, at the 69th Regiment Armory in New York, the same building which housed the famous "Armory Show" of 1913. It was the showing of the work that had come out of a collaboration between ten artists and about thirty engineers.

Originally, the Swedish organization which had invited ten American artists was going to supply, in addition to artists' fees and travel expenses, $10,000 for the making of equipment. The artists themselves raised $5,000 more from American sponsors.

The artists involved were John Cage, composer; Lucinda Childs, dancer and choreographer; Oyvind Fahlstrom, painter and author of theatre pieces; Alex Hay, painter and choreographer; Deborah Hay, dancer and choreographer; Steve Paxton, dancer and choreographer; Yvonne Rainer, dancer and choreographer; Robert Rauschenberg, painter and choreographer; David Tudor, musician and composer; R. Whitman, author of theatre pieces. The engineers, most of whom were from Bell Telephone Laboratories, worked on their own time. These people were brought together by Billy Kluver, a Bell Laboratories physicist, who has in the past worked with several artists including Tinguely, Jasper Johns, John Cage and Robert Rauschenberg.

This article is based on a series of interviews with the artists and the engineers, on conversations and parts of meetings which were recorded in notes, and on a journal in which were recorded my impressions of how the project was progressing.

The first meeting was easy, stimulating, and had a sense of glamour about it. People indulged in pretending that there were going to be unlimited funds. The artists asked about buildings with walls made of warm air. Masses of materials that would decay before your eyes. They asked about being lifted on growing masses of styrofoam. About television systems that could instantly turn live action into slow motion. Yes, most of these things were possible. Theoretically possible. But above all, these fantasies served as a first meeting ground for two groups of people who had sought each other out and who didn't yet know how to work together. No artist felt that he absolutely had to have walls of warm air but everyone wanted to get the ball rolling.

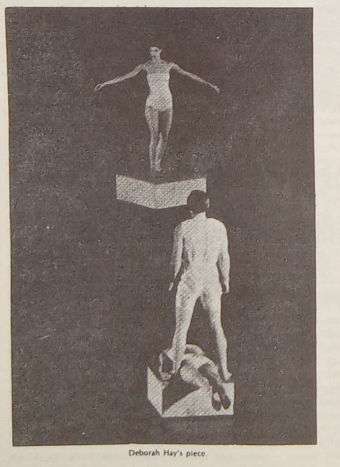
Billy Kluver: The amazing thing is that it's possible for artists and scientists to talk together at all. The first meeting I was scared. Then, the minute it came down to the hardware it was working. It's like a triangle between the scientists and the artists and the hardware. The main thing is to establish a working relationship and the hardware is the basis for this.

All the artists were interested in participating in a situation which was too large for them to control as opposed to a studio situation in which the artist privately works as well as he can. Many were interested in shifting the center of where a piece is conceived, from themselves and their studios, to a new and unknown place somewhere between the engineers and themselves.

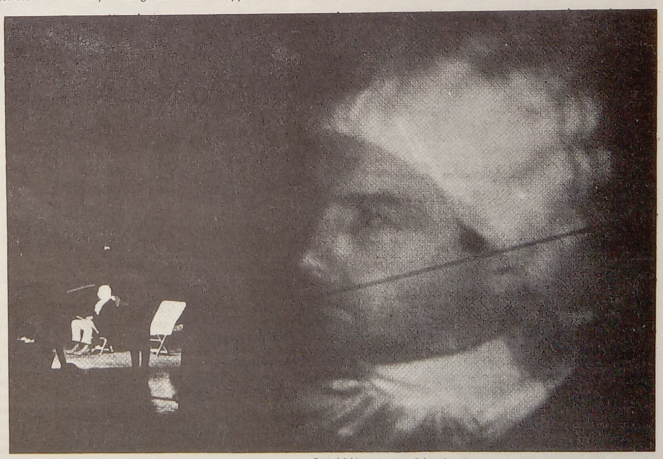
Whitman: It's a genuinely vanguard situation and a lot more demanding than most situations. The most we can expect to do is to very tentatively approach it, finding out what it means, and step off the deep end maybe, but I don't think anybody is really going to be able to do that. One thing that could happen is that our ideas of what an image is will change. We're still dealing with images in a pretty conventional way, I think. That's one of the things that interested me. What might happen to what one's idea of what an image is. What new elements we can add to it. How can we describe an image? Or what's the image that we can describe now? Where is that located? I mean what is it that we can find out and describe using a computer or any other modern tool that we can't do otherwise?

Oyvind Fahlstrom: I'm interested in enlarging and renewing conventional theatre. In combining different aspects of one thing that is going on. Different angles. Closeups. I want to pick up and highlight details. In theatre it's usually hard to convey anything but large clear goings on. I've been interested in details in the past. In Sweden I did a piece in which I used the image of pricking skin with a pin. Of course, few people in the audience could see it. Now you can pick things like this up (with closed circuit TV) and get a many-faceted impression.

Lucinda Childs: One of the first things that I thought of when I thought of movement was something like the movement of a turtle, say, in a tank, and the infinite possibilities of making it somehow more than it is. Like the movement of the water. What happens to the water. The displacement of space in terms of the water in



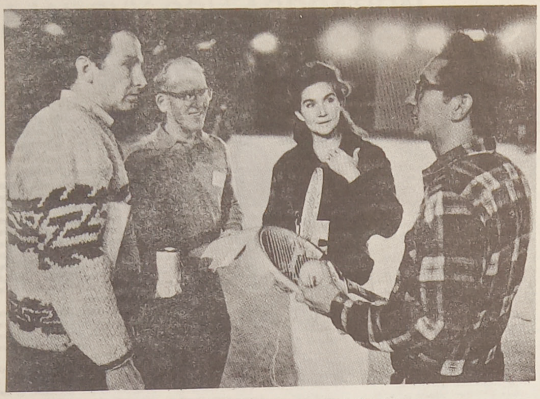
Deborah Hay's piece



Oyvind Fahlstrom's piece: Robert Rauschenberg as Buston.

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Robert Rauschenberg (left) discussing tennis-playing sequence of *Open Score*. At far right, Frank Stella.

motion, synchronization, the lack of synchronization. Anything that can be made for the brain somehow to take in. Made into that kind of information.

Robert Rauschenberg: *When you're working with something that's as physical as radio equipment, what's absurd to do is very quickly determined. The machine has no tolerance for getting outside a particular radio wave or whatever it is you're working with. The kind of equipment we're inviting has its own integrity built into it. Whereas an artist has to somehow assume integrity or not. I think just that experience of dealing with these kinds of material that have this particular character is probably going to end up being an enormous influence on the work esthetically.*

In many ways, setting up a working relationship was the biggest hurdle for some of the artists. Some didn't accomplish this till the end of the summer. Some never really did. Perhaps there was a lot of shyness on the part of both the artists and the scientists. The business of getting to work started slowly. People sent out feelers.

Jim McGee (technician) 3/9: *I called Steve (Paxton) a few times. There's a lack of understanding by the scientists of what the artists want. They would accept a lot of things but it's a question of what they would prefer. For example, Harold H. is building Fahlstrom's antimissilemissile (a balloon which follows a performer around). He was working hard to make a rectangular balloon. I suggested he make it round. Harold called Fahlstrom who said that was even better. I can see the other side; it's difficult to know what the finished product will look like.*

R. Whitman, 3/24: I haven't called the scientists, I hate to take up their time.

Larry Heilos (tech) 4/5: *The artists shouldn't feel restricted in their demands. We can tell them if what they want can be done now. Cage wants to get video through audio. People in industry would throw up their hands and say you can't do it. We have to try it out. We may lose a few dollars worth of tape. The requests are not surprising. Many are on electronics. Many are challenging, such as Fahlstrom's missile. I'm running down TV information. And I've been on the tail of a guy at Beva Electronics who says he can build infrared TV. The only thing to do is to tell the guys in industry from the very beginning what you have in mind. The cooperation has been great. I've talked with NBC on occasion and they're very cooperative.*

Jim McGee (tech): I think the artists are not thinking as vaguely as they are giving the impression of doing.

Alex Hay: *My first ideas were fantasy, science-fiction type ideas. I had ideas about machines that were going to move me about. A whole environment just for the purpose of various ways to deal with the human body. Then I began to feel that this didn't fit in with the technical things that were going to be available. For the most part, what they've been talking about, what seems to be more available are materials and processes and methods in communications.*

Dick Wolff (tech) 4/1: The artist should suggest, then leave the technology to the scientist. Then he should return with enough flexibility to accept what the technician has solved. When you say remote control this and that, this means hours of work on our part. You have to limit yourself to what you've said, because we're working on it.

Kluver: Ideas are interesting when they're still on the abstract plane. But then it takes time to make them. It's a problem because the engineer will lose interest if the artist isn't there. The artist has to take a more active part in the duller aspects of it. The procedure of initial freedom, work, and then freedom again is not clear. There has to be an initial period of freedom where you sort of get familiar with things. Then there has to be a period where the artist decides with the engineer that this is it, let's finish this. Let's not do anything else or fool around any more. Then of course it's up to the artist to use it or not. If he rejects it afterwards, that's better, I think, than changing his mind or showing less interest during the period of work.

John Cage: We would use the sound system using the electric cells to trigger the sound sources. Simply make use of all the material and the modulation system we already have.

Kluver: How many do you want of . . .

Cage: I'm very easily satisfied. I like any number you mention.

Author's journal, 6/17: *There's a lot of anxiety, and a lot of joking among the artists with whom I have the most contact. I get the image of Rauschenberg trying to back up into an idea. I took part in a conversation which amounted to: Art and Oceanography. And a discussion of that. Art and Criminology. And a discussion of that. Art and Travel. And so on through a long list and several drinks and laughter. Bob Whitman has referred to Billy Kluver as Fu Man Chu, the evil genius, mad scientist.*

Whitman: I want to go back to ropes and pulleys and yelling for communication.

Rauschenberg: *Isn't there a kind of intimidation going on, like: technology, even if it isn't functioning, is perfect?*

Let's talk about the show. When we meet with the technicians, we talk about equipment. At our meetings we talk about equipment. What is everybody going to do? Let's talk visually.

By June the project had divided into two general sections. One was the individual pieces of equipment that the artists had asked for, like Lucinda Child's Doppler effect machine, which could detect movement that happened in front of it and indicate this movement by making a kind of swishing sound. The other section was the wireless system. In effect, the wireless eventually became a system of portable equipment which amounts to ten radio stations. It has about three hundred components which are little pocket-sized aluminum boxes. These are portable electronic amplifiers, equalizers, transmitters, receivers, distant control equipment, delayed reaction equipment, and proportional control equipment. As David Tudor used the equipment, the sounds of a bandoneon, a musical instrument similar to the concertina, were not directly heard by the audience. The sounds were transformed into oscillographs projected on screens or were made to activate many things which were seen and heard. Certain tones could directly trigger a light to go from off to on, or could pass through the proportional control equipment and cause the light to gradually become brighter, or could pass through the time-stepping device and cause the light to go on a minute after the occurrence of the tone. The wireless system can simultaneously remote control, by radio signals, multiple sounds, lights and movements of objects. Each of the components can work together with the special pieces of equipment required by the individual artists, or together with any of the other components in the system.

Kluver: *We have this large system which has more or less grown and I think that we're stuck with it now. Personally I think that it's a great idea. We should have a couple of people who exactly follow it through till our first tests, which will be in early July. Really keep in touch. I don't even have the feeling that people know what the system is yet. What it can do. And I've tried to talk but nobody has sort of shown an interest to say "Tell us what this thing is, what are the limitations of it," and so on. A lot of the things that people say they want to do they will be able to do with this but I don't think even they know that they can do that.*

Meeting, 6/15, Steve Paxton: When can we have the wireless to play with?

Kluver: August first. The first week in July will be a time when we'll show as many things as possible. There are a lot of decisions, like amplifiers and the choice of speakers. I have bought about eight or nine different speakers which have all kinds of criteria.

Alex Hay: We need baffles for speakers.

Kluver: You've got to start from the beginning; what the speakers are, then the baffles. The general situation is that we have people working on all the aspects of this wireless. *(Billy gives a lot of technical description of the wireless system. The artists look blank.)* It is just too difficult for me to act as an in-between and handle twenty engineers and ten artists. I can't call people for every single screw. I tell artists to call scientists and scientists to call artists and no one calls. If there isn't direct human contact between you and the person working with you, if I have to do it, then it isn't contact. There are so many decisions going on now that you should be making along with the engineers. Like, should the boxes be square or flat.

Hay: As functional as possible.

Kluver: That's not how things are made. You take what's on the shelf and if something special is needed, you . . .

Author's journal, 6/24: *From my understanding of the system it seems to me that it will act as a reactionary force. A luxurious tool which will facilitate the doing of things which are usually done with light boards, tape machines, and a crew of people. I may be wrong. We shall see. But it seems to be aimed at making a demonstration for an audience. Well, that seems pretty basic. Why does it bother me? I have the feeling the engineers have jumped the gun on the artists. I must find out what requests of the artists were directly answered by the wireless system. How consciously did the artists ask for it?*

Dick Wolff (tech) 11/17: Someone asked if we could turn lights on and off by remote control with no connections [this required a radio transmitter to send signals to a receiver connected to the lights]. From that we realized what we had and started describing it to other artists and they started asking more questions and having other ideas. Debbie's request for remote control of eight platforms gave us the necessity for channels [because this required eight transmitters, each sending stop & go signals to a separate receiver]. So we went ahead and used the channels for other things too. Tudor and Cage used the channels extensively. Cage used them to turn speakers on and off as he walked in front of the lights. Tudor to turn on and off lights. We didn't use all the equipment to its fullest but that's for the future. After we had built that equipment, Rauschenberg's idea of the rackets came along [a transmitter attached to a tennis racket to transmit the sound of the ball hitting the racket]. And that was a good idea. We tried it out here at the labs and in fifteen minutes we knew it worked. Billy came down the hall with tennis rackets and asked me if I had a transmitter and receiver and we hooked it up and stood in the hall hitting the ball back and forth and it sounded just like it did in the show. It just required some smoothing over, hiding the transmitter and making the sound better.

The fact that so much work went into communications was largely because of the influence of the engineers. You can accomplish a lot with two tin cans and a string but we're not happy with that. It's not sophisticated enough. The decoder that Robbie (Robinson) made did something that was never planned or asked for and the artists went and used it. That was the time-stepping that Cage and Tudor used [a delay mechanism by which, for instance, a light might go on a minute after receiving its "on" signal].

Kluver: *The wireless is like the crown of the whole thing. There's nothing like it that exists on the market. Actually what we're doing is putting radio in the theatre. We asked the FCC for 15 frequencies for continuous performance between the 13th and the 23rd of October. This is really much more fantastic than anything else that has been done.*

By late July, communications between the people in Sweden who had invited the American artists to take part in the Stockholm Festival and the people in the USA had broken down. As the American artists and engineers had already been working for several months, they decided to continue and to have their showing in New York. This meant that they were going to have to raise, from private sponsors, all of the money that they would need.

The question now was whether to show on a large scale or to do the performances in a modest place like, for instance, a roller rink on Staten Island. The artists decided to go big because that was more exciting and more dangerous.

In early August we started investigating the Armory. It was available. Billy asked me to run a radio test on it to see if our wireless system would work. I took my FM radio and, standing outside the Armory, I found a weak signal. I then brought the radio inside hoping that the signal would disappear. It didn't. It came in louder and clearer. The building wasn't going to shield us from interference. On the contrary, it was acting as a great antenna, bringing us all kinds of extraneous signals. I called Billy from the Armory phone booth. He said the engineers would deal with it somehow.

Next, the engineers ran an acoustics test on the building. They went in with speakers. The place was like an echo chamber. You couldn't get a coherent sound. The decision was made to stick with the Armory anyway. The space itself was beautiful. I started calling chair rental companies for estimates for one thousand seats. Then for one thousand five hundred. Then for two thousand.

Author's Journal, 9/29: *Saturday September 10th was the first day that all the equipment was brought together in one room. It was called an equipment rehearsal and it took place in the gymnasium of the Berkeley Heights High School. This seemed to give a great boost to the general morale. The engineers saw the results of their work falling into some kind of shape, and the artists got a tangible view of what the wireless system was, what it looked like, what it could do. The gym was rented three weekends running and during these times there were constant conversations between individual artists and engineers and among the engineers themselves.*

Robbie Robinson (tech) 9/14: When the decisions were made for an equipment rehearsal everyone got very excited, now that there were pieces to see and so forth. You see, up to this point there were a lot of little individual things. I think, were a venture like this to be repeated, I would want one central workshop where all the engineers and technicians came to work together. This would be one way to stimulate morale or interest right from the beginning.

Alex Hay, 9/17: *I want to pick up faint body sounds like brain waves, cardiac sounds, muscle sounds, and to amplify activity, its changing tempo and value. But we'd underestimated the problems about the transmitters. And Schneider was only assigned to me three weeks ago, and the first tests were just made last Wednesday. Billy thought the amplifiers they had could be modified but they can't. Now Cumminsky and Coker are working on it.*

Author's journal, 9/25: The second half of Rauschenberg's piece will use, for sound, tapes that will have been made during the first half. That is, they will be recordings of the sounds made by the balls hitting the prepared rackets. Herb Schneider thought that the tape loops could be triggered electronically in a predetermined, programmed relationship. This would avoid having McGee have to run around and watch the machines and keep rewinding the tapes. Bob says, "I don't want to figure out at what moment all the machines will be working. Making that kind of decision is the traditional art way. Of course, even programming might necessitate some practical considerations such as, for example, tape three and four can't go at the same time because they're on the same machine." But what Bob wishes is to have McGee "work like crazy to get everything going and keep it going."

Schneider (tech) 11/1: *What really appalled me was that on September 15th no one really knew what we were going to do on October 13th except in a very general way. Then we talked for six hours with each of the artists and then made up the drawings [diagrams of the different combinations of equipment that the different artists were going to require]. David Tudor was asking for functions I couldn't visualize. Then I made the drawing. We talked back and forth making corrections till we finally beat it into shape. I couldn't understand what he wanted until I could visualize it and he couldn't communicate it to me in those terms because he's not used to visualizing functions. When I began to get this collection of drawings, I began to realize that we'd better simplify the whole approach. That is, to program the connections, so that we could shift one artist's piece to another's without extensive replugging. [This would require something called AMP equipment which essentially is a kind of switchboard. All the non-portable audio and lighting equipment such as the power amplifiers and the power relays were to be permanently wired into this AMP equipment. Then, by inserting a different program-card or board for each performance, the appropriate connections would automatically be made. The right set-up of lights and speakers would be ready to roll.]*

Author's journal, 10/8: One of the engineers said, "What we need is a lot of unskilled labor." And there were two dancers and a composer — Cindy, Yvonne, and Cage — stripping wires. It occurred to me after the second day of putting tiny plugs on wires, at a table at which there were two to three artists at all times doing the same, that the activity, the situation, was an engineer-directed one. Maybe it was that our eyes and fingers had been so concentrated on those little wires for so long that it seemed like a world of wires.

Cage said about stripping wires, "This is very mysterious because you can't see what you're doing. You can't see what's under it. It's typical of this technology."

Waldauer said that David Tudor was "up to his haunches in cable. He's running into the limits of wiring. He'll have to have all his equipment connected before he gets to the Armory. And then it'll take a couple of days to connect it to the Armory. We'll have to epoxy all his equipment and him to a board and bring the whole

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thing into the Armory in one piece."

The schedule of rehearsals in the Armory had been carefully made out without any foreknowledge of the complications that were to arise with the wiring. The schedule was immediately abandoned. The ten artists rehearsed as best they could. None ever got a full dress rehearsal.

We soon found that another big handicap was that it's not within the professional scope of either the artists or the engineers to set up equipment in the field, so to speak. In fact, the artist who has worked in a performance medium has more experience with setting up theatrical equipment than does the engineer. As it turned out, our lighting expert, our riggers, and our electricians were the only ones who were professionals with experience in large productions.

Author's journal, 10/7: *I talked to Yvonne last night. She's had her first rehearsal of the movement or performance part of her piece. The props or technical devices are not all ready and she thinks she'll have to do without several of those things. She says working is very different from what it usually is for her. She has to get things each day like tape, tubes, etc. And make a lot of calls. She says these jobs keep interrupting her work. She misses working. Says she's never worked in such an abstract, distant, cerebral way. The piece is all in her head but she won't know what it will be like, what it will look like, until the rehearsal a couple of days before the performance. That so much of the work is out of the artists' hands. The actual getting the work done is so much in the hands of the engineers, the prop makers, the riggers, etc.*

Author's journal, 10/11: I talked to Cage today. He was again crimping wires. I asked him about his piece . . . was it ready? He said there was nothing he could do on it. He had already made the arrangements for getting the various materials such as the encephalographs live from the hospital, and the phones answered and left off the hook in the various places [such as Luchow's and the Bronx aviary], and the various appliances.

The engineers still had work to do on equipment, which he doesn't understand. And Tudor, who is figuring out the modulations for him, is too busy working on his own piece. He had told the engineers originally what he wanted and now he was glad to accept the results that they came up with.

The first two nights started very late and were drastically rough.

Author's journal, 10/13: *The audience was incensed. There was a feeling of disaster. Robbie (tech) said to me, "You guys are emotionally prepared for this. We aren't." I tried to tell him that we're used to having audiences boo, hiss, and walk out. That the history books are full of accounts of performances at which the audiences were incensed and which later were recognized to be important achievements. Robbie kept saying, "You guys were emotionally prepared."*

Schneider (tech) 11/1: Those first two evenings of performances we were plugging in more wires at once than I ever knew I could handle. It was a mess. Tudor was operating on a fraction of what he should have had going for him. Rauschenberg's piece started very late, when it was finally decided that the automatic control of his lights just wasn't going to function [the sound from the tennis rackets was to activate the off switches on the lights]. After the second evening, and the decision to stay up all night and to get the wiring system in order, we were all right in the control room. And I still feel that if we hadn't used that wiring system, we would have had the same struggle the rest of the nine days that we had the first two.

On the third day there was a meeting of the engineers at which the decision was made to go at 8:40, no matter what. Up to that time we were purists. Initially, all the artists had encouraged us in this. No artist said, "Let's fake it, let's do it by hand."

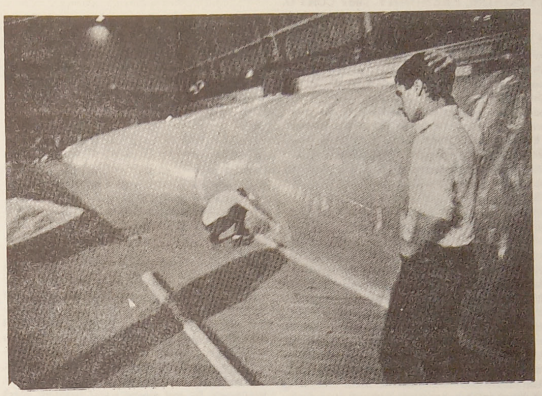
Simone Whitman (to Kluver) 10/30: *How could it have happened that after all this work, we went on without rehearsals?*

Kluver: *I know exactly how it happened. I didn't have the presence of mind to put a stop to what I saw happening with the AMP equipment and start the engineers working on a simpler system. What they had set out to do was a three month job. And they would have had to do it in three days. So the week that should have gone into rehearsals was spent in wiring the patch board. All the equipment was to be checked out, rehearsed and adjusted. Instead, there was no time, and on opening night the interconnection system was still not working and we didn't have any alternate back-up system.*

Clive Barnes, New York Times, October 15: The level of the technology was such that the performance started 40 minutes late, a 15-minute intermission lasted 35 minutes and even a loudspeaker announcement was so indistinct on the apparently unsound sound equipment that it became unintelligible. God bless American art, but God help American science . . . Perhaps the other shows will be better — already they are sold out.

Rauschenberg, 10/13: *We should make an announcement to the audience that they are welcome to watch the set-up from the chairs. They should understand that we're involved in a process and not in presenting finished products.*

Kluver: My vision of it was that the audience wouldn't even know that technology was involved, but if an engineer came around he would say, "My God, what are they doing!"



Steve Paxton and *Physical Things*.

A poet who came to the Armory remarked that working with technology is like a return to the prima donna. The equipment might do wonderful things or at the last minute it might decide not to work at all.

Schneider, 11/1: You should let the public in on what you're doing. Why not tell them that some of the sounds they hear come from Hong Kong or a Geiger counter. We're not trying to popularize science mechanics. But in broad terms just the functional idea that you can make use of certain devices to produce certain effects is of interest. We should have taken them into our confidence to establish a link there. To bring the experimental situation to the public. Of course then it would have been unfair to ask $3. And you wouldn't have gotten so many people if you had asked 25¢. Of course they received their money's worth but not as they had expected. But they should have participated more.

Cumminsky (tech.): *I went to one of the evenings and I was bored.*

Author: *How do you feel about the things you see in galleries?*

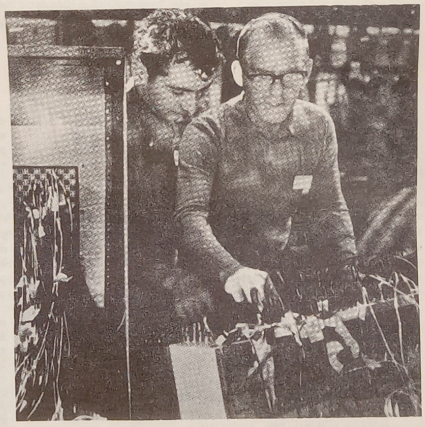
Cumminsky: *That's different. When you go to a gallery, you're not constrained to linger at the pictures. I envied the reporters, who could wander around. Art's more like window shopping. When you sit down you're ready to get entertained.*

Author's journal, 11/12: 9 Evenings was presented on a large public scale, an experimental proposition. That was an exciting thing to do. Maybe that's what Waldhauer meant when he said "The Festival wouldn't have had the impact if it had worked better."

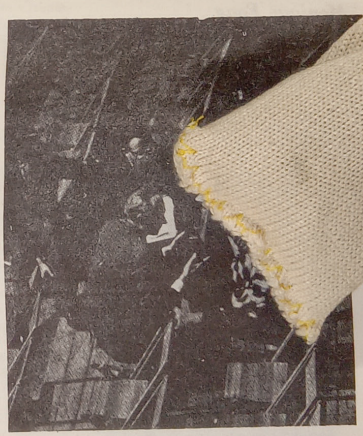
Billy Kluver, 10/15: There are three elements fighting. The artists, the engineers and the audience. These three will have to come to some resolution. It seems to me that this will take several years. And I think that's good. Because the situation is really new. And it's better to leave problems unsolved until a solution develops through an organic process of experience with this new thing. After all the idea of having 2000 people present as an audience to some end product might have been an obsolete, habitual thing to do which didn't really apply to what had been going on between the artists and the engineers. I don't know. But I'm sure that many, many problems will not so much be solved as abandoned in favor of other problems more pertinent to what can come of this way of working. ■



Artists and engineers examining ground effect machine.



Engineers Flynn and Robinson in the control room.



Engineers conference: left to right, Ralph Flynn, Fred Waldhauer, Herb Schneider, Cecil Coker, Robbie Robinson, Billy Kluver.

BILLY KLUVER

THEATER AND ENGINEERING
AN EXPERIMENT
2. Notes by an engineer

It is not a question of what the artist *should* do, but what he *will* do with technology. Whether technology is good or bad, threatening or friendly, beautiful or ugly is irrelevant. The qualities and shapes of technology are not the proper concern of the artist.

Claes Oldenburg suggests an enormous teddy bear monument in Central Park while Gyorgy Kepes discusses the limited interest of the artists in the large scale environment.

We have to learn to listen to the artist.

If you ask what he wants he will not tell you. If you hang around long enough he will. Are you really there to listen?

Science and art are inevitably separated. Any attempt to "bring the two together" should be looked at with suspicion. Science deals with reality in rational, single-valued terms which are constantly related to a language that is uniquely understood. Art deals with the reality in irrational and poetic terms. Art allows for discontinuities that science cannot tolerate. History must have provided us with the separateness of art and science for a reason.

At the time of Aristotle, the Greeks cut the orange the other way. Agnos: mathematics, lawsuits, poetry and rhetoric. Techné: sculpture, painting, physics, medicine and crafts. Today the scientist and the artist share both Techné and Agnos.

A scientist could not work with an artist. What would they talk about? ESP? The beauty of the stars?

Would a scientist be able to work creatively if he had to live in the social situation of the artist? No other profession has as many guardians as that of the artist. If we tried to make the artist's situation as secure and free as that of the scientist we would probably be doing something wrong. But food, space, and material help.

Have you ever met a normal, healthy and working engineer who gives a damn about contemporary art? Why should the contemporary artist want to use technology and engineering as material? Only when a working relationship has been established between artists and engineers can we give answers. The 9 Evenings was a *deliberate attempt by ten artists to find out if it was possible to work with engineers. Their investment in terms of putting-yourself-on-a-limb was considerable. For ten months they worked with thirty engineers and were able to make a series of beautiful performances out of the collaboration. I believe it was John Cage who remarked that the* 9 Evenings *"was like the early movies" where the camera, the stage, the literary content, and the acting were all separate and easily identifiable elements. An unmixed media. The horseless carriage — the wireless microphone — theater and engineering.*

All decisions concerning 9 *Evenings* were made by the artists and myself during innumerable meetings. Because of Bob Rauschenberg's remarkably positive attitude and sensitivity, his contributions to these meetings were significant in terms of shaping the 9 *Evenings*. He reduced fear and limitation with a few words. He also took on a large part of the responsibility for raising the necessary money, a task which led him into many difficult and ungrateful situations. 9 *Evenings*, however, above all, a cooperative effort where everyone took on the responsibility he could and wanted to handle. Whenever possible, decisions were first considered from the artists' point of view.

The name of the performances at the Armory came out of long arguments about what we were doing. The day "Art and Technology" was left behind was a day of relief for everyone.

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ART FORUM, FEBRUARY 1967 CONT'D.

It was decided early that no special emphasis should be placed on the technical elements in each performance. The obvious reason for this decision was to prevent situations from becoming technically "interesting." Engineers were given credit in their biographies, and not in the program notes. No excuses for technical failures were to be given. Each artist was given as much freedom to develop his work as possible. Restrictions in terms of props and stage equipment were eliminated.

We decided to reach for a large audience. It appeared logical to do this because of the large investment of the artists and of their commitment to technology as a material. But it seemed also necessary to make an attempt to break the Judson Church barrier of 500 faithful spectators and to confront a larger and unfamiliar audience with the works of contemporary artists. It was strongly felt that the presentation of the performances should be as conservative and as traditional as possible, to avoid the "fun" and "happening" atmosphere. Randomness, errors, and failure were never elements in the performances. Every effort was made to make everything run as smoothly as possible without compromising the artists' wishes. From the technical side the artists were assured that everything would work until we knew otherwise.

Much has been said about the inadequacy of our sound system for speech reproduction. The acoustical problems of the Armory were well-known before we moved in. A plan was set up for an alternate speaker system to handle speech. This plan was, however, rejected by the artists.

Over the nine day period every artist performed his work twice. Each evening was dealt with as a separate and independent event. By distributing the performances randomly it was hoped that at least some of the performances would be seen twice. The over-emphasis on opening night by the audience proved, however, almost impossible to fight and the rough nature of our first two nights became the primary topic of most of the reviews. (I have since heard that almost every Broadway show has a rough beginning.)

The delays have interested the critics more than anything else. On the first night we started 40 minutes late due to difficulties with the general complexity of the situation at the Armory. The second night there was a 30-minute delay due to technical difficulties. From then on we decided to start on time no matter what the problems were. Our half-hour intermissions proved impossible to shorten.

There were over 8500 engineering hours of work that went into the 9 Evenings. This makes a total of more than four man-years of work for the 30 engineers involved. A low estimate of the value of the engineering time is 150,000 dollars. During the 16 days in the Armory 19 engineers worked more than 2500 hours and three of them worked more than 250 hours each. The audience was a little over 10,000.

The equipment that was built for 9 Evenings was in many respects remarkable. Each artist had his own specific project: Lucinda's Doppler sonar and ground effect machine, Debbie's remote control platforms, Steve's loops, Rauschenberg's IR TV and transmitters in the handles of the tennis rackets, Oyvind's chemical reactions, antimissile-missile, snowflakes and transmission systems, Yvonne's walkie-talkies and programmed events, Whitman's TV and mixing panel facilities, Alex's differential amplifiers, Cage's photocells and telephone pickup of sounds, Tudor's use of Kieronski's vochrome and the rest, in particular the SCR circuits. In addition to these special projects we built an electronic system which we called TEEM. This included amplifiers, transmitters, receivers, tone decoders, tone encoders, SCR circuits, relays, etc. It also included a proportional control system which was used successfully by Cage, Tudor and Debbie. TEEM had the following general design criteria: each unit was to be as small as possible and battery-powered. A sufficient amount of units was to be available for quick replacement. All units were to be portable. TEEM was designed to fulfill the function of an on-stage environmental electronic system.

The growth of contact between the artists and the engineers was the most fascinating aspect of the *9 Evenings*, one which I can only briefly touch on here. From the engineer's point of view, *9 Evenings* presented complex technical problems. The engineers had never seen any of the artists' performances before moving into the Armory, and most of the artists had never spoken to the engineers. Most of the engineers, in fact, were without any previous contact with contemporary art. They worked hard in their spare time, and tried to communicate with the artists who lived in New York. It was not until the second night of the performances that the engineers, enclosed in the control booth, really understood the position of the artist and what he was trying to accomplish. The artist was on stage, completely exposed to a large audience, and demonstrating his faith in the engineers. After that second night, everything began to clear up. The vagueness about what the artist was up to had disappeared; the engineer could now evaluate his own contribution to the artists' work and step some distance from his natural commitment to his gear.

It is inevitable that the engineer's work has to precede that of the artist. This makes any collaboration highly imbalanced, but when all is fused together there are great possibilities for give and take. It was on the simple, practical level that the best results of the artist-engineer relationship were achieved; our best experiences came from the projects where the artists had worked with the same engineers from the first idea to its realization.

Critics and public had a field day at the engineers' expense. Because of our decision not to discuss the technical aspects of the performances, the engineers found themselves in a paradoxical position. Anything that was assumed to have gone wrong (whether it actually did or not) was attributed to technical malfunctions. This reaction by the critics and the audience reveals both an unfamiliarity with technology and a rather infantile expectation about technology as "performer." Much was said in the press about technical equipment that failed, but no one got very specific. Mr. Barnes, Miss Genauer, Miss Adler and others had a merry time declaring the engineers to be amateurs, incompetent, fooled by the artists, etc. Are they really serious?

The engineers, of course, have a very accurate record about what failed, where and why, and what we interpreted as wrong engineering decisions. From the technical point of view (one from which none of the critics seemed able to observe with competence) the engineers did a fantastic job — by any standards. Half of the performances were more or less completely successful; others suffered from a few failures which were by no means as catastrophic as the critics implied.

The answer to the reaction of the critics must lie in the fact that they never considered what was going on. They had never thought about the relationship between an engineer and an artist, and confused the engineers' contribution with the artists', and vice versa. This, combined with the remarkable unfamiliarity with professional engineering (which achieved a high-point in Mr. Clive Barnes's explanation, in the N.Y. Times, of Lucinda Childs' ground-effect machine, and in his later comments on a TV program that the machine was held up by "high frequencies") leads one to wonder about just what the function of the critic really is.

We had our best reviews in *Electronic News* and *The Wall Street Journal*.

If professional engineering is not made available to artists on a large scale, the technical elements that do appear in works of art run the risk of becoming precious, if not ridiculous. We have established a foundation called Experiments in Art and Technology *which will attempt to provide a link between the engineering world and interested artists. It is apparent to us that ultimately the problems of the artists must be handled by industrial laboratories and that the development of the problems must be paid for by industry itself. It is the purpose of EAT to convince industry to accept problems posed by artists. Simultaneously, a file of interested consulting engineers will be established who can take care of simple problems directly. It is hoped that EAT will become an efficient service organization that will deal only with the technical aspects of the artists' problems.* ■

LES LETTRES NOUVELLES, PARIS, MARCH/APRIL 1967

Etats-Unis

Monique Fong

Lettre de New York

Ayant depuis longtemps annexé le rêve, le hasard, nous continuons d'apprivoiser la réalité qui, elle-même, constamment se multiplie. L'art ne se reconnaît plus que les limites, provisoires et mobiles, qui lui cc viennent. Les expériences s'inscrivent dans l'ordre naturel des choses.

On a pu voir l'une de ces expériences à l'Armory de New York qu'un nu descendant un escalier a rendu pour longtemps fameux. *Neuf Soirées : Théâtre et Technique*, tentative particulièrement ample par ses moyens et le nombre de ses participants — tournant où l'on peut mesurer ce que nous a jusqu'ici donné la rencontre (non fortuite) de l'art et de la technologie.

Les dix artistes du groupe de New York ont eu de la chance. Billy Klüver, qui avait aidé Tinguély à réaliser son *Hommage à New York* en 1961, leur a permis de faire appel aux talents de plus de trente ingénieurs des laboratoires de la Bell Telephone Co pendant plusieurs mois. Il a en outre créé une fondation qui doit permettre à ces échanges de se poursuivre.

Ces artistes travaillent ensemble depuis des années. Ils se ressemblent. Ils ont à des degrés divers le souci de prendre les choses comme elles s'offrent à eux, sans catégorie ni hiérarchie, liées entre elles par la seule nécessité du tout. Attitude « zen » en quelque sorte.

***J'aime que les techniciens soient visibles et, s'il faut déplacer un objet sur la scène, que ce soit fait de la façon la plus directe, la plus simple. On y va et on déplace l'objet »*, dit Rauschenberg, ce qui s'applique au théâtre Nô aussi bien qu'à ses propres spectacles.**

L'une des surprises du festival est d'ailleurs qu'avec tant d'éléments communs au départ et la volonté constamment présente de fonctionner en tant que groupe — artistes et ingénieurs, artistes apparaissant dans les œuvres les uns des autres — ces œuvres aient été si différentes, si reconnaissables.

Le *morceau* (piece) de Robert Rauschenberg s'appelait *Open Score*. Titre ambigu — *score* signifie, entre autres, *partition* et *compte des points*. Il commençait par une partie de tennis réelle, mais jouée avec des raquettes spécialement équipées. Le bruit des balles, très amplifié et retransmis successivement par plusieurs haut-parleurs diversement placés, réglait l'éclairage. Le jeu se terminait au moment où l'immense halle devenait complètement obscure. Un groupe de cinq cents personnes prenait alors la place des joueurs. Eclairées à l'infrarouge, celles-ci n'étaient visibles qu'indirectement sur d'immenses écrans de télévision. Le bruit de cloches des ballons continuait et accompagnait leurs mouvements. La foule sortait lentement, on croyait le spectacle fini. A ce moment-là, un faisceau de lumière ordinaire apparaissait, découvrant un homme qui transportait d'un point à un autre de l'espace vide une forme enveloppée de toile d'où sortait une voix claire de femme qui chantait en espagnol.

On reconnaît la manière de *voir* de Rauschenberg. Les choses sont données pour ce qu'elles sont, leur identité la plus littérale n'est à aucun moment niée. Détournée seulement, comme les objets de terrains vagues. « L'usage de ce qui est familier devient obscur, l'usage de ce qui est exotique familier », il n'y a pas de conflit entre le réel et le surréel mêlés et mutuellement dépendants. Pas de conflit non plus entre ce qui nous est donné à voir et les moyens employés pour le faire. Ils se produisent ensemble et reposent l'un sur l'autre, ils sont également vulnérables. Le seul conflit est l'impossibilité où nous nous trouvons de voir autrement qu'en reproduction quelque chose qui se passe sous nos yeux. Il nous maintient en éveil. Puis quand nous pensons que tout est dit, la signature de l'humour. Comme dans certains tableaux une photographie brouillée ou l'empreinte de sa main, Rauschenberg lui-même passe silencieusement.

Le travail de John Cage était celui qui se rapprochait le plus de l'expérience pure — mise en présence par le chercheur d'un certain nombre d'éléments, puis déclenchement parmi ces éléments d'actions réciproques dont l'issue est imprévisible. Dans le cas particulier, il s'agissait d'utiliser le système sonore collectivement conçu pour le festival, en même temps que les « sources sonores présentes dans l'air au moment de la représentation, captées par des chaînes de communications, lignes téléphoniques, microphones. » Cage et quatre autres exécutants s'occupaient activement à brancher et à débrancher des circuits, à varier des intensités, couvrant et découvrant des projecteurs lumineux qui envoyaient leur silhouette sur un écran. Aussi le morceau, *Variation VII*, était-il par la force des choses aléatoire quant à la forme et au détail. Les musiciens se trouvaient dans une position privilégiée, mais non différente de celle des spectateurs dont un bon nombre justement circulaient allégrement autour de l'estrade.

***Kisses sweeter than wine* d'Yvind Fahlström se présentait comme tentative de théâtre total — jeux télévisés, déclarations de l'auteur, irruption de l'actualité sous la forme d'une tête géante de Lyndon Johnson ou de films personnages robots incapables de faire face à une crise humaine, machines par contre capables de prendre l'initiative, le fond de la mer, l'avenir — morceaux du monde qui nous entoure mis en exergue et le spectateur prié de tirer ou de ne pas tirer de conclusions, au choix. Pas de beauté, ou d'une forme si nouvelle que nous ne savons pas la reconnaître comme telle. Ni émotion ni plaisir. Fahlström est assez jeune pour que les choses dont il se sert pour ses « rites d'initiation » ne soient pas pour lui des découvertes. Il fait un inventaire. Mais c'est un inventaire d'une surprenante intelligence et probablement le spectacle le plus riche d'idées de tout le festival.**

La technique, annexée plutôt que dédaignée, a permis d'accompagner les mouvements d'un homme des bruits émis par son propre cerveau, ses muscles, les mouvements de ses yeux ; de préserver l'aléa dans le ballet jusqu'au moment de l'exécution ; de faire flotter des danseurs dans l'espace. Elle a permis d'ajouter à certains morceaux une dimension visible, à d'autres une liberté nouvelle. Elle aurait dû permettre, en tout cas. En sortant de plusieurs de ces spectacles, on doutait. On en avait tant attendu. La nouveauté de l'outil avait-elle paralysé les imaginations ? Et pourquoi n'avait-il pas mieux fonctionné ? Fallait-il s'en prendre aux artistes ? aux ingénieurs ? La panne accidentelle provoque un sentiment de connivence agréable, comme lorsqu'un acteur fait un faux mouvement. Ce n'était pas le cas. A l'exception des œuvres les plus fortes — celles que j'ai décrites — et de quelques moments, on était privé du plaisir de prendre part. Isolé dans un hangar trop grand, dans des œuvres interminables, on restait *sur sa faim*.

Mais ces impressions, curieusement, se transforment. Avec un peu de recul, le mauvais usage de la durée, la mise au point insuffisante s'oublient. Reste une richesse qui étonne.

Il paraît que l'ensemble des contrôles mis au point pour le festival fait l'envie des producteurs de Broadway. Il paraît qu'en travaillant avec Robert Whitman, les ingénieurs ont redécouvert un phosphore qui sert déjà à des expériences de lasers.

Sans doute est-ce dans l'ordre des choses. Les artistes, eux, n'ont fait que ce qu'ils avaient à faire. Ils ont jeté leur filet sur des choses qui nous entourent, mais que généralement nous ignorons ou refusons, faute surtout de savoir quelle attitude prendre à leur égard. Ils nous ont montré comment nous réjouir de ce que nous avons, comment en tirer un supplément de magie.

PALETTEN, APRIL 19

EAT – EX

BILLY KLÜVER

Experiments in Art and
(EAT) bildades i samband
of Theater and Engineering
året. Namnet hittades på
som skötte inkorporeringen.
gineering" med i namnet
under New York State law.
Vid vårt första öppna
deltog över 300 konstnärer,
tresserade. Massor av brev
ligen från konstnärer, skol
ingenjörer från hela världen.
ves har EAT existerat i tio
300 konstnärer med teknisk
kontaktat oss. Det är målare,
grafer, skulptörer, kompositör
Dessa konstnärer har i de fle
EAT från vänner. Utom genc
letter (av vilket två nummer u
ännu inte gjort någon ansats
EAT. Vi räknar med att det f
finns mellan 2 och 3 tusen kon
som vill komma i kontakt m

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har vi nu 75 medlemmar med
grund. Men vi behöver 1000 in
lemmar bara för att tillfredsstäl
närer som kontaktar oss.

Mot bakgrund av det stora in
konstnärernas sida, det relativt r
set från den tekniska världen o
farenhet vi fått av de projekt som
vi satt upp programmet för EAT.
här skissera några av detta program
punkter. (Intresserade kan sända a
och adress till EAT, 9 East 16th, Ne
New York, 10003. Vi sänder gärna vår
letter.)

EAT arbetar för ett direkt samarbet
lan konstnärer och ingenjörer där båda
terna intar samma "status". Vårt insisterar
på ett arbetsförhållande mellan ingenjö
och konstnärer kommer från att vi funnit a
den personliga kontakten ger de bästa möj-
ligheterna att överbrygga den språkbarriär
som existerar mellan de två grupperna. Vi-
dare är den överväldigande delen av de tek-
niska problem som konstnärerna har av en

MIZUE, JUNE 1967 EXCERPT

演劇とエンジニアリングの

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PALETTEN, APRIL 1967

EAT – Experiments in Art and Technology

BILLY KLÜVER

Experiments in Art and Technology, Inc. (EAT) bildades i samband med "9 Evenings of Theater and Engineering" i oktober förra året. Namnet hittades på av den advokat som skötte inkorporeringen. Vi ville ha "engineering" med i namnet men det gick inte under New York State law. Vi tycker om det.

Vid vårt första öppna möte i december deltog över 300 konstnärer, kritiker och intresserade. Massor av brev kommer nu dagligen från konstnärer, skolor, museer och ingenjörer från hela världen. När detta skrives har EAT existerat i tio månader. Över 300 konstnärer med tekniska problem har kontaktat oss. Det är målare, poeter, koreografer, skulptörer, kompositörer av alla slag. Dessa konstnärer har i de flesta fall hört om EAT från vänner. Utom genom vårt Newsletter (av vilket två nummer utkommit) har vi ännu inte gjort någon ansats att publicera EAT. Vi räknar med att det för närvarande finns mellan 2 och 3 tusen konstnärer i USA som vill komma i kontakt med ingenjörer.

Motsvaras detta enorma intresse från konstnärer av ett liknande intresse från ingenjörer och vetenskapsmän? Det har visat sig att den tekniska världen är så gott som helt ointresserad av nutida konst. Från "9 Evenings" hade vi byggt upp en stam på 20 ingenjörer och vetenskapsmän som hållit intresset. Utan att gjort någon propaganda har vi nu 75 medlemmar med teknisk bakgrund. Men vi behöver 1000 ingenjörsmedlemmar bara för att tillfredsställa de konstnärer som kontaktar oss.

Mot bakgrund av det stora intresset från konstnärernas sida, det relativt ringa intresset från den tekniska världen och den erfarenhet vi fått av de projekt som pågått har vi satt upp programmet för EAT. Jag skall här skissera några av detta programs huvudpunkter. (Intresserade kan sända sitt namn och adress till EAT, 9 East 16th, New York, New York, 10003. Vi sänder gärna vårt Newsletter.)

EAT arbetar för ett direkt samarbete mellan konstnärer och ingenjörer där båda parterna intar samma "status". Vårt insisterande på ett arbetsförhållande mellan ingenjörer och konstnärer kommer från att vi funnit att *den personliga kontakten ger de bästa möjligheterna att överbrygga den språkskillnad som existerar mellan de två grupperna.* Vidare är den överväldigande delen av de tekniska problem som konstnärerna har av en sådan natur att man inte kan "beställa" en lösning. Problemen är vagt formulerade, ofta byggda på någon andrahandsinformation och av naturliga skäl har konstnären ingen kännedom om alla tekniska alternativ som kanske skulle finnas. Vad som händer när konstnären och ingenjören mötes är i regel att ingenjören ger konstnären nya idéer som i sin tur ingenjören reagerar emot. Ett slags pingpong match uppstår. I andra stadiet arbetar ingenjören ut den tekniska lösningen och i det sista sker de anpassningar som är nödvändiga för konstverkets slutliga utförande. Jag vill inte säga att detta schema är ett idealschema för samarbete – när båda parterna blir mer sofistikerade tar samarbetet andra former.

EAT kommer inte att uppfostra konstnären till ingenjör eller verka för ingenjörens "humanisering". Vi är inte intresserade i ett intellektuellt samarbete. Vi är inte intresserade av att addera konst och teknik men av det tredje "något" som uppstår när konstnären och ingenjören möts. Något liknande som hände under renässansen när vetenskapen för första gången började samarbeta med tekniken är vårt mål.

Om ingenjören är "konstnär" så fungerar i regel inte samarbetet. Hans estetiska fördomar hindrar ett öppet ställningstagande till problemet (vilket samme ingenjör säkert har i andra tekniska sammanhang). På samma sätt så måste konstnären förstå sin tekniska begränsning och lära sig lyssna (med tålamod ofta) till ingenjören.

Genom demonstrationer, bull-sessions, besök på laboratories kommer vi att försöka hålla konstnären ajour med vad som händer på nya tekniska områden. Detta kommer inte att ske genom föredrag. Dessa är för formella.

Att etablera ett effektivt och fruktbart samarbete mellan konstnärer och ingenjörer är den ena av EAT:s huvuduppgifter. Den andra är att övertyga industrin att kostnader, material och arbetskraft för de tekniska projektens utförande måste komma från dem. EAT skall helt understödjas av industrin och organisationens ledning skall rekryteras från industrin. Om det skall vara någon mening med konstnärens användning av vad tekniken kan ge så måste han ha tillgång till all teknik och till den nyaste tekniken. Ingenjören kan inte arbeta effektivt efter klockan fem på problem av samma svårighetsgrad som under dagen. Om inte industrin garanterar konstnärens tillgång till tekniken kommer snart de konstverk som innehåller "avfallet" eller "allmosorna" att dominera. Resultatet kommer att bero på tillfälligheter i stället för att härstamma från en genuin konfrontation mellan konstnären och ingenjören. Konstnären klarar sig alltid med en penna om det skulle behövas.

EAT:s program är att arbeta för ett samarbete mellan konstnärer och ingenjörer med industrins stöd. Medlemmar i EAT utgöres av intresserade konstnärer och ingenjörer. För ingenjören är EAT en professionell organisation och hans förhållande till EAT är liknande hans förhållande till den tekniska föreningen. Det är medlemsingenjörernas uppgift att översätta konstnärens ursprungliga idé till ett praktiskt genomförbart tekniskt projekt, att överbrygga språkgränsen. När ett projekt är utarbetat kommer det tillbaka till EAT:s administrativa ledning, som sedan "utbjuder" projektet till industrin. Genom sina medlemsingenjörers insats kommer EAT att kunna presentera tekniskt klara projekt för industrin.

EAT kommer alltså inte att etablera ett eget laboratorium, informationsbibliotek eller annan teknisk service för konstnärerna. Vi anser att detta är orealistiskt och opraktiskt: tekniken finns inom industrin och EAT skulle aldrig kunna uppta en effektiv tävlan.

Inom två områden har EAT intressen som inte direkt anknyter till vad jag redan beskrivit. Vi kommer att arbeta för etablerandet av professionella "Engineering in Art"-grupper inom de tekniska föreningarna. Ett accepterande av en sådan gruppbildning finns redan inom IEEE (Institute for Electronics and Electrical Engineers). Dessa professionella grupper skall ha till uppgift att återföra de tekniska problemen som uppstår genom samarbetet mellan konstnärer och ingenjörer till det professionella planet och till tekniken. Dessa grupper kommer också att arbeta för ingenjörens (eller vetenskapsmannens) professionella ställning i samband med tekniska konstprojekt.

Det andra området som intresserar EAT är att ingenjörerna undervisas i konstnärens situation på universiteten (inte i konst, alltså). Vi skall försöka genomföra ett intimare samarbete mellan konstskolorna och ingenjörsskolorna – inte för undervisning inom respektive områden men för samarbete med projekt på ett tidigt stadium.

Vad jag beskrivit är ofta planer men mycket har hänt under det senaste halvåret. Vi har lärt oss en del om olika samhällsklassers inställning eller brist på inställning till nutida konst. Det har visat sig vara relativt enkelt att nå industrins ledning och det ser när detta skrives (4 juli) ut som om vi inte skulle få några större problem med att utverka industrins stöd. Många praktiska problem kvarstår naturligtvis att lösa: konstnärens miljö måste t ex förbli oförändrad i sin kontakt med industrin. Vi har tills i dag fått besked om stöd från IBM och AT & T. Vi beräknar att det kommer att ta ett år innan förhållandet till industrin utarbetats effektivt.

Att nå ingenjörerna är för närvarande vårt största problem. Vi vet att när de väl kommit i kontakt med konstnärerna så försvinner alla fördomar. Dom blir "påtända". Men hur når man ingenjörer som inte vet att det existerar något som heter nutida konst eller som har en fru som målar och därför anser moderna konstnärer vara utan vett? Eller de som helt enkelt inte är intresserade? Vi planerar artiklar i de tekniska tidskrifterna Spectrum, Scientific American etc men är skeptiska beträffande deras effekt. Den personliga kontakten är den bästa vägen vi funnit att nå ingenjörerna på. Vi planerar därför "EAT-Ins" där ett antal konstnärer besöker ett laboratorium och får träffa ingenjörer och vetenskapsmän. Sådana EAT-Ins är planerade på MIT, Dupont, och IBM.

Vi har ett högkvarter i New York på 9 East 16th Street där konstnärer och ingenjörer kan mötas och arbeta. Vår administration kommer att bli på hörnet av 68:de gatan och Park Avenue där vi från den förste januari får disponera kontor och möteslokaler i ett nyrenoverat "brownstone" hus. Ett bidrag från "The New York State Council on the Arts" klarar av våra administrativa kostnader till en början. Vi söker för närvarande en "verkställande direktör" som skall leda EAT och upprätthålla kontakten med industrin.

EAT:s mål är att föra två vitt skilda grupper tillsammans. Vi betraktar inte detta som en kulturell men som en revolutionär handling. Vi är inte intresserade av en syntes mellan vetenskap och konst men i vad att sammanförande av två skilda områden kan leda till.

MIZUE, JUNE 1967 EXCERPT

演劇とエンジニアリングの九晩

中谷 芙二子

現代科学と技術が生んだ多くの新しい素材テクノロジーおよびエンジニアリングを芸術家が自由に使えるよう便宜をはかることを目的とした E. A. T グループ (Experiments in Art and Technology, Inc.) は、昨年暮ニューヨークでローシェンバーグを中心とする芸術家たちによってオーガナイズされ、いよいよ今年1月からその活動を開始した。芸術と現代テクノロジー、この一見相容れぬ2つの領域における協力を目ざした E. A. T グループ、それを生む母胎となったのが昨年10月13日から23日までニューヨーク市のアーモリー（歩兵師兵舎）で行われた"演劇とエンジニアリングの九晩"である。入場料3ドル、1700人の観衆を前に都合8時半から3～4時間エンジニアリングを使った新しい視聴覚総合芸術2～3作品づつを公開実験したのである。会場として選ばれたアーモリーは、体育館を思わせる円形外の競馬以上の空間。現代美術を初めてアメリカに紹介して大スキャンダルを巻した1913年ニューヨーク・アンデパンダン展が開かれたところである。参加した芸術家は画家のロバート・ローシェンバーグ、アレックス・ヘイ、オイヴィンド・ファルストレム、作曲家のジョン・ケージ、デヴィッド・チュードア、映画を使った舞台作品で知られるロバート・ホイットマン、ダンスで活躍するシンディ・チャイルズ、デボラ・ヘイ、スティーヴ・パクストン、イヴォンヌ・レイナーの10人。

この芸術型は、明らかに現代美術史に一エポックを画することを意図して行われた、そして、ニューヨークの社交界・美術界をはじめ、遠くはヨーロッパからまでも集った多くの愛好家、評論家たちの期待の中に幕を開けた。しかし、いよいよ公演に入ってみると、準備不足のため、機械の故障が続出、その能力の半分も活用されなかったと思われる。ニューヨークのマスコミ界からは"素人芝居のおぼつかなさ""神よアメリカの科学を助け給え"などと評されながら9日間の幕を閉じた。しかし、作品評価はともかくとして創造行為の新しい在り方を提起したという点で"エポック・メイキング"の役目は十分に果したようである。

「我々の身辺は現代科学に基づいて開発された新しい技術および素材で囲まれている。それらを認識することは、その時代に生きる芸術家にとって一つの義務である。……現代テクノロジーがもはや生活の一部となった今日、芸術家もまたそれを題材で創造することは出来ない」（ローシェンバーグ）。この言葉でも明らかなように、芸術とテクノロジーの間の壁を打破ろうという一つの意識の試みの根底には新しい異質の認識という問題意識があった。そのうち最も重要なことは彼らが現代テクノロジーをあくまで足掛の手段として使うということである。いわゆるテクノロジーをテーマとして扱ったのではなく、素材として扱ったのである。このような問題意識をもつ芸術家が現代のあらゆる物を素材とし創造のプロセスを通して他との"かかわり合い involvement を持つ時、当然1段として必要になるのが現代テクノロジーである。今回の試みは、出来上った作品だけを見た場合、これ迄のハプニングとスクールの違いこそあれ、質的には同じであったといえるかも知れない。また多くの人がそういっている。しかし私はそこに出発点での問題意識における本質的な相違をみる。そしてこれら芸術家たちが試みた新しいアプローチと創造のプロセスは、今後当然新しい可能性へと彼らを導くであろう。

こうして多くの問題を提起した"演劇とエンジニアリングの九晩"——無数の可能性を前に有頂天になった芸術家達が、準備期間9ヵ月の中に10人がそれぞれ…つの作品を創り上げた"セリフなしの舞台芸術""Wordless Theatre"をここに公演の順を追って紹介してみよう。

1. スティーヴ・パクストン "物理的事物"

これはタイトルが示す通り広い会場一ぱいに物的環境を用意した試みの作品。開演が1時間も遅れ、待ちくたびれた1500人余の観客は、不服そうにしかし緊張した面持ちで案内されたプラスチック製トンネルの中を行く。作者が"ダンス"と呼ぶこの作品は、見に来た人たちのダンスなのである。そがてプラスチック・ドーム内の広場へ出る。そこで高々小島のスライドを見る。そしてまた小路へ、トンネルは絶えず変化しながら続く。たるんだプラスチックの壁面、さまざまな色彩のフラッシュ、人間の動き。この全長500フィートのトンネルをくぐって、いささか退屈し、息苦しくもなった観客たちは出口へと急ぐ。最終のプラスチック・ストラクチャーは、天井までとどく100フィートのタワー。中に入って上を向くと高所恐怖症の緒覚に陥る。

トランジスター・レシーバーを渡された外へ出ると鳥声がそれを通して入ってくる。人が位置をかえると音も変る。牛の鳴声、魚釣の手ほどき、ニュース、あちらこちらと動きながら音を求める人たち。頭上に張られたくもの巣状のネットには、非常に小さい発信装置がいくつか隠っけてあったのだ。外から見るとこの半透明プラスチック・ストラクチャーは、円筒、ドーム・タワーからなる白い風景である。この作品は観る人をも素材として扱った点に特徴があり、会場構成という点でスケールの大きい作品。

2. アレックス・ヘイ "車輪"

会場の真中に小さなテレビ・カメラ、後方に大きなスクリーンが据えてある。音の発信体である男（A. ヘイ）が頭に耳にワイアーをつけ2対の箱を背負って入場し、そこに積まれた6尺角の大台を九個前に1枚づつ広い会場の床一面に並べる"ヘイの玄関も靴も乗せる大台の表面は全部皮膚の色に塗めてある。合計64枚を正確にごばんの目に並べる。その長い単調な作業に観客は退屈する。それが終ると彼はカメラの前に坐る。スクリーンに顔が大写しとなる。苦悶裡作された体内の音——脈搏、筋肉や目の動き、心臓の音など——が聞え始める。質的には同じであったといえるかも知れない。また多くの人がそういっている。しかし私はそこに出発点での問題意識における本質的な相違をみる。そしてこれら芸術家たちが試みた新しいアプローチと創造のプロセスは、今後当然新しい可能性へと彼らを導くであろう。

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1. スティーヴ・パクストン "物理的事物"

これはタイトルが示す通り広い会場一ぱいに物的環境を用意した試みの作品。開演が1時間も遅れ、待ちくたびれた1500人余の観客は、不服そうにしかし緊張した面持ちで案内されたプラスチック製トンネルの中を行く。作者が"ダンス"と呼ぶこの作品は、見に来た人たちのダンスなのである。やがてプラスチック・ドーム内の広場へ出る。そこで高々小島のスライドを見る。そしてまた小路へ。トンネルは絶えず変化しながら続く。たるんだプラスチックの壁面、さまざまな色彩のフラッシュ、人間の動き。この全長500フィートのトンネルをくぐって、いささか退屈し、息苦しくもなった観客たちは出口へと急ぐ。最終のプラスチック・ストラクチャーは、天井までとどく100フィートのタワー。中に入って上を向くと高所恐怖症の緒覚に陥る。

トランジスター・レシーバーを渡された外へ出ると鳥声がそれを通して入ってくる。人が位置をかえると音も変る。牛の鳴声、魚釣の手ほどき、ニュース、あちらこちらと動きながら音を求める人たち。頭上に張られたくもの巣状のネットには、非常に小さい発信装置がいくつか隠っけてあったのだ。外から見るとこの半透明プラスチック・ストラクチャーは、円筒、ドーム・タワーからなる白い風景である。この作品は観る人をも素材として扱った点に特徴があり、会場構成という点でスケールの大きい作品。

2. アレックス・ヘイ "車輪"

会場の真中に小さなテレビ・カメラ、後方に大きなスクリーンが据えてある。音の発信体である男（A. ヘイ）が頭に耳にワイアーをつけ2対の箱を背負って入場し、そこに積まれた6尺角の大台を九個前に1枚づつ広い会場の床一面に並べる"ヘイの玄関も靴も乗せる大台の表面は全部皮膚の色に塗めてある。合計64枚を正確にごばんの目に並べる。その長い単調な作業に観客は退屈する。それが終ると彼はカメラの前に坐る。スクリーンに顔が大写しとなる。苦悶裡作された体内の音——脈搏、筋肉や目の動き、心臓の音など——が聞え始める。質的には同じであったといえるかも知れない。また多くの人がそういっている。しかし私はそこに出発点での問題意識における本質的な相違をみる。そしてこれら芸術家たちが試みた新しいアプローチと創造のプロセスは、今後当然新しい可能性へと彼らを導くであろう。



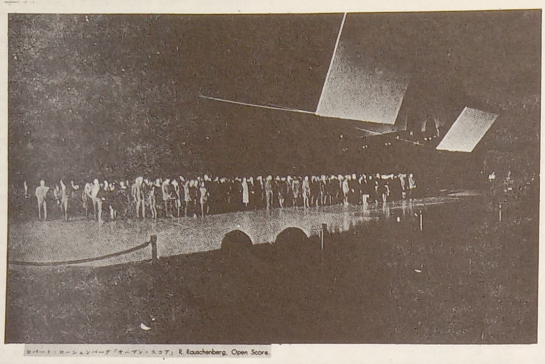
バック・ステージのエンジニアたち Engineers Back stage. Photo : Peter moore

レビを通した間接的現実、ネガとポジとが交錯して映る画面。突然マイクからは、市民一人一人の自己紹介の声、カメラはきわめて日常的なこと——例えば上着を着たり脱いだり、ひと匙に乗ったり脱り脱りになったりしている市民の脚の動きを追う。しかし画面が不鮮明でちっとも見えない。前様く首立たない時が続つ。すると、どこからともなく起ってきた人間の生の声。歌とも叫びともつかぬ静寂の声がだんだん大きくなり、マイクの声をのみ込んでテレビは消え音は止む。フイトがつく、500人の市民の静寂が不意の変号で観衆の方を向いて立っている。今度は市民たちの方が、一生懸命手を叩き声を発して演じている観客の静寂、じっと見ている。フイトが消え、市民たちは静かに退場。

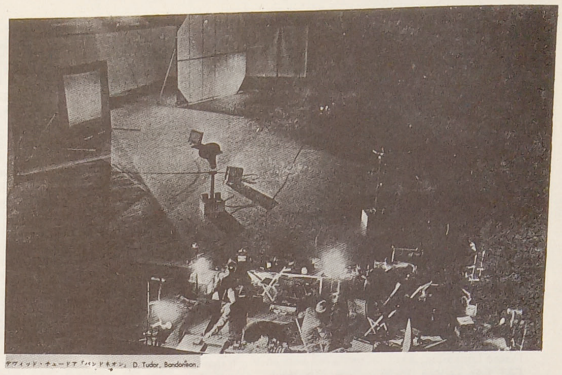
カデンツァ（2回目の公演のみ）——500人の静寂があった後、真暗な会場の床にとり残された"白い荷袋をスポット・ライトがとらえる。作業服姿のローシェンバーグが現れ、その白い荷物を抱きかかえるようにして会場の片隅へ運ぶ。突然恋しい異国民謡をうたいだす。その白い塊、再び登場したローシェンバーグはそれを観客席の

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ロバート・ローシェンバーグ「オープン・スコア」R. Rauschenberg, Open Score.



デヴィッド・チューダー「バンドネオン」D. Tudor, Bandoneon.

通路へと運ぶ。スポット・ライトが長くのびてそれを追う。うたい疲れるその白い塊、それを再び抱えて退場する作者。私はこの3部からなる作品が、科学の方法を芸術に適用したものであると見る。即ち、現実の把握(前奏)、分析・総合のプロセス(主要部分)、エッセンスの抽出(カデンツァ)である。

5. デヴィッド・チューダー "バンドネオン"

これはバンドネオンという1つの楽器が持つあらゆる属性の一つ一つを自発させて総合したものをエレクトロニックスを通じて視聴覚的にアウトプットさせたもの。会場の片隅にエレクトロニックスの機械を並べた舞台があり、その上で電線の山に囲まれたチューダーがバンドネオンを弾く。生の音が機械を通って音のスペクトルとなり、あらかじめのプログラミングされた回路を経てリモート・コントロールのスピーカーから出て来る時には、巨大な会場のスペースを包む複合音楽と化す。投影化された音楽がオシログラフとなって大きなスクリーン3面にそれぞれ異った光のシンフォニーを奏でる。休みなしの機械の思考のような音楽、それは会期中観客を最も興奮させた公演であった。機械の効果を最大限に使った作品。

6. イヴォンヌ・レイナー "輸送分離"

これは会場の床一面にマットレス、枯木、材木、鉄板、フォームラバーの枕などが適当に配置され、10数人のダンサーが任意の場所に立っている。高さ75フィートのバルコニーからウォーキー・トーキーによって作者が任意に選んだ動きを伝達する。腕につけたレシーバーで命令を聞いたダンサーは指定の位置へ指定の物を運び、そこでまた静止する。1人または1人と不連続的にこの運搬の行為が淡々と続く。一方、周囲では物が競って文字的な劇を演ずる。黒い風船が揺る、フルートが空を渡る、白い煙がどっと噴れる、突然無表情の人間が地上75フィートの空中をブランコに乗って往復する。しかし舞台では特別のコマのように人間が命令された動作のみを行い続ける。その異常な無関心さ平静さに苛々した観客の1人が、舞台にとびこみ枯木をつかんで投げ始め、警官につまみ出された。この作品は、人間の行為の中から"運ぶ"というひとつの概念を抽出したものであろうか。

7. ジョン・ケージ "変奏曲 VII"

暗い会場の片隅、エレクトロニックスの機械が並ぶ小さな舞台から光が溢れ、機械と人間をやわらかく包む。動く人間と機械の作り出すパターンが壁面に不定形にセットされた2面のスクリーンに影絵を映して美しい。不思議な音のコラージュが会場を満す。音の素材はニューヨークの街頭・病院・レストラン・新聞社・警察署そして会場から演奏時間中受話器をはずしたままの電話や無線を通して入って来るニューヨークの生活の音。それらがあらかじめプログラミングされた機械を通り、ケージ他4人に操作されて美しい音響作品となる。使われた楽譜は前日の競馬の点数成績表。"現実世界"に対するチャンス・オペレーションであるこの作品は、2回目の公演がなかったならば、ケージのこれまでの作品とあまり変りなかった。第2回目の公演の際、あらかじめ予定された2、3人に続いて観客が1人、2人と会場を横切って機械の囲りに集り、みるみる中に舞台の周りに人垣のシルエットが出来、立つ人、坐る人、歩く人で大きな暗い会場は人の星座で一杯になり、この日の演奏は最も美しい一つのイヴェントとなった。美しい自然な形で聴衆が中に入り込んだ作品である。

8. ルシンダ・チャイルズ "膠運車"

これは芸術のための機械第1号T.E.E.M (Theatre Electronic Environmental Modulator) を使ったもの。FM音楽放送のチャンス・オペレーションによる人間と物との不説用なダンスである。T.E.E.Mとはマイク・トランスミッション・フォートセル・テープレコーダー、アンプリファイアーなど10数個の装置を連結させたシステムで、これを使ってひとつのコントロール・ステーションから舞台の背景照明効果を自由に操作出来る。小型で操作が簡単なことが特徴で既製の機械トラック1台分の量が片手で持ち歩けるサイズまで縮小されたもの。この外エア・クッションで床上数ミリ浮かせた箱、ドプラー効果なども使われ、可能性は大きかったが表現の段階でこれまでの様式から脱し得なかった。

9. ロバート・ホイットマン "2つの水穴"

ホイットマンは映画と舞台のダブル・イメージを主題にした劇場ハプニングを初めてブロードウェイで商業的に続演した作家である。"2つの水穴"ではプラスチック・シートで被われた8台の乗用車が次々に入場し、会場を静かに一巡りして白い壁の前に止り、車中に装置した小型映写機で映画やテレビを映す。飛行機の離着陸のカラー映画の逆写し、服を着たり脱いだりする女のフィルム、無邪気なペンギンのカラー・テレビ、植物生長の高速度撮影、テレビ・コマーシャルの繰り返し、会場のバルコニーに据えた凸面鏡に映る美女のテレビ復元、もはや、複製の意味を失い新しい現実となったそれらの映像は、一体となってひとつのパノラマ的イメージを創る。映画・テレビの音にかぶさるようにバートランド・ラッセルの平和談話が聞こえる。作者はこの作品の中で映画・テレビの効果を最大限に使うことによって復元手段の弾力を実証し、合せて集合的イメージの大不協和音を演出した。

10. オィヴィンド・ファルストレム "膠物は酒より甘し"

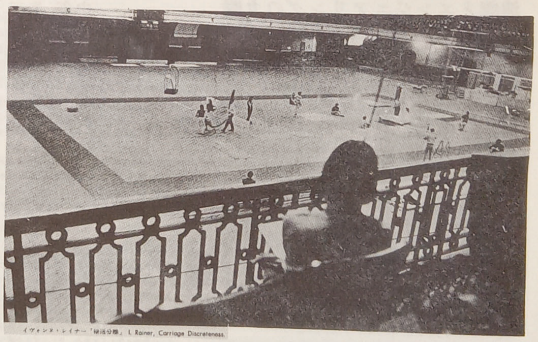
この作品を説明するには彼の絵を想像してもらうのが一番早道であろう。社会的日常的物理的化学的生態的空想的物語的具象的手習的ハップニングが断片的に並列する白いキャンバスである。このキャンバスがある日突然立体化し、人と物とが運動のエネルギーを得てそこに描かれた通りの事件を演じ始めたと思えばよい。白い地面が忽ち始める——"接物は酒より甘し"の音楽に合せて白い地面から男女数人が現れ、毛沢東とポプ・ホープのプラカードを持ってデモ行進——スライド・映画・テレビの3つのスクリーンにそれぞれ映る18世紀の男、SF映画、ベトコンの床屋——枕の投げ合い——数桁の掛算を暗算でする男——透明な風船が昇る——ジョンソンの首、その上にかぶした男の手が血みどろになる——雪に包まれる男——木箱の裏女——銀色のミサイル型のバルーンがリモート・コントロールで空中を一廻り——兵隊と11才の娼婦の会話——100フィートのロープで作られたブランコに乗る男女——洗濯物のようさがった物干ライン——ベートーヴェンの音楽、スクリーンに街を行くボブ・ホープと毛沢東のダミー隊——ロボットの映画——ニューヨーク市民のインタビュー"あなたは幸福ですか?""23人の中22人はとても幸福。1人だけが不幸ですと答える"なぜ幸福?""健康だ、欲しいものは全部ある、家族がいる、トラブルがない、金がある"フィナーレでは銀の雪を降らせる裸の美女"宇宙人"が犬から下る。地上で白いワイシャツ着流しの男女10数人に迎えられ、ゴム製LBJの頭と大きズミを載上され、それらを両手に網羅う。地上からはアドバルーンの白鳥が舞い立つ。非常に豪華的な作品。人間のロボット化、高度の機械がもつ優性さ、ベトナム戦争批判などの社会風刺を織り込んだ唯一つの政治意識を表現したものである。使われた技術は、リモート・コントロール・システム、クローズド・サーキット、テレビ・力学的技術、それに多くの化学薬品。紫外線と数え上げれば際限がない。

こうして、この作品は初めから終りまで同じ密度で延々と2時間続くのである。作者のアイディアの豊富さには驚くが、機械・技術を使う点について、単に効果を目的として"ただそれが使えるから"という形で用いられた場合が多く、そのメカニズムが内包する可能性の開拓にまでは至らなかった。これは彼の作品に限らず、今回の試み全般についてもいえることである。しかし初めての試みでそこまで期待するのは無理であろう。

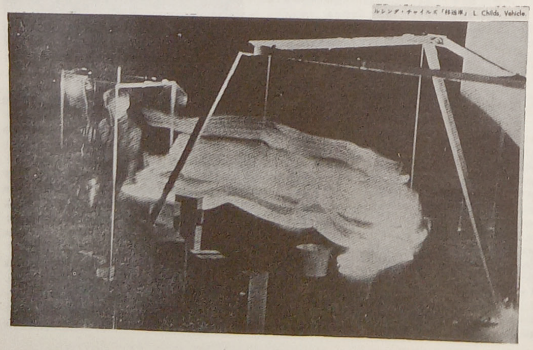
以上、私はただこれら10人の芸術家の作品をパノラマのように次々と紹介しただけであるが、彼らの持つ新しい問題意識を分け合う現代の芸術家たちに少しでも参考になれば幸である。



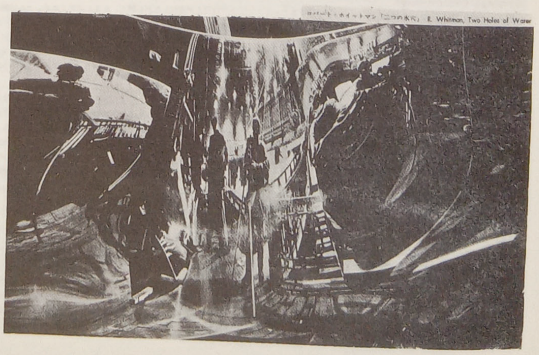
オィヴィンド・ファルストレム「接物は酒より甘し」(ローシェンバーグの大写しテレビ画像) O. Fahlstrom, Kiss's Sweeter than Wine.



イヴォンヌ・レイナー「輸送分離」I. Rainer, Carriage Discreteness.



ルシンダ・チャイルズ「膠運車」L. Childs, Vehicle.



ロバート・ホイットマン「二つの水穴」R. Whitman, Two Holes of Water

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The Future of Responsive Systems in Art

In the fall of 1966 the first festival of art and technology took place at the Sixty-ninth Regiment Armory, New York City. This "9 evenings: theatre and engineering" was housed in the same building that contained the historic Armory Show of 1913. Here was the first calculated, large-scale attempt by engineers, artists, and dancers to pool their talents in the recognition that art and technology were no longer considered alien forces subverting each other. Billy Klüver coordinated the technics of the affair; this is the same Bell Telephone physicist who has acted as adviser for many important Kinetic exhibitions since 1960. Because of numerous technical breakdowns and lack of rehearsal time the "9 evenings" were pretty much written off as an avant-garde catastrophe by the popular press. Not least among the accusations were those of naïve use of electronics by the artists, drawn-out repetition of unstructured events, and a tendency to play up to the press, ironically courting bad reviews as well as good. It did seem, as Klüver subsequently indicated, that the problems of the electronic systems had not been fully ironed out, and there were initial emotional antagonisms among some of the more conventional technicians concerning the goals of the artists.

For some viewers there were satisfying exceptions such as Robert Rauschenberg's "open score" badly played tennis game, where rackets were wired for amplified sound. Then the indoor tennis court, flooded with infrared light, was projected onto three large screens for audience viewing by closed-circuit television. There the ghostly forms of five hundred people milling around the court filled the screens.

Alex Hay gave a very austere solo dance accompanied by the amplified sounds of his brain waves, heartbeat, muscle and eye movements. With two assistants, his "work activity" was to lay down and pick up one hundred, numbered, skin-colored cloth squares (FIG. 133). Another time, into the vast open area wafted fragments of live radio programs and the sound-amplified body movements of the audience itself. While failures occurred particularly in the first performances, when the gear of the engineers had not been properly "de-bugged," or it visually overwhelmed the performers, once in a while an event would relate to the biological presence of the audience so that the traditional object-observer relationship was severed.

But, if anything, the inflexibility of some of the artists, not the engineers, provoked the real wrath from the critics. Some performers motorized sodden ideas from happenings while others childishly unleashed political harangues and unpleasant sensorial assaults on the audience. Insufficient rehearsal accounted for most of the time delays, along with unfamiliarity with the Armory spaces. And as one critic, Erica Abeel, put it (December, 1966–January, 1967, p. 23): "...the real problem does not lie with the nuts and bolts." In a follow-up article Billy Klüver defended the work of the engineers as being extraordinarily professional and successful, considering time and money limitations and the technical requirements. From the articles by participants in the "9 evenings" the major impression to come across is the subtle symbiotic relationship that developed between the artists and engineers, both hardly dreaming that such a rapport would be possible. That they did find common interests and means of working together was a discovery that dwarfed, in their eyes, all subsequent reactions. But this outcome hardly appeased the audience at the time.

Most critics panned the "9 evenings" as either poorly contrived happenings or dull theatre, even by avant-garde standards. Few if any had the prescience to appreciate the events for what they were: *man-machine systems* with a completely different set of values from those found in structured dramatics or the one-night kinetic spectacular. In the professional theatre the automatic pre-set lighting console is a wonder whose very efficiency rests on the fact that it does so much, but remains unnoticed to the audience. The new artists want to magnify, to isolate for its own sake, this relationship between performer and system. Lucinda Childs's air-supported vehicle, John Cage's sound mixer, Deborah Hay's radio controlled platforms, Yvonne Ranier's "theatre electronic environment modular system," and the audio amplifiers of Alex Hay were all constructed as physical extensions of the human performer's abilities. The exploitation of these extensions *for their own sake* is a foregone result of the technological demiurge. Billy Klüver has specified that over 8,500 engineering hours went into the Armory events, amounting to $150,000. For the critics this was akin to an elephant's going through two years' gestation and then giving birth to a mouse. Yet the perceptual set necessary for the appreciation of such man-machine alliances will only grow as the relations between the two become both subtler and clearer.

A further development of the "9 evenings" saw the founding of E.A.T. (Experiments in Art and Technology, Inc.) in January, 1967. E.A.T. is administrated by many of the people who carried out the "9 evenings": it draws its artists (300 at this writing) and engineers (75) from all over the country. E.A.T. tries to provide technical assistance for the artist by acting as a "matching agency" between artists with specific, feasible projects in mind and engineers competent to solve these problems. In its role as a clearing house for ideas, E.A.T. with its technical staff hopes to establish new connections between the art-world and industry, facilitate dialogue between the artist and engineer leading to new aesthetic insights, and give out information as needed by both groups concerning recent innovations in both fields.

Already within a year of its inception several facts have become apparent to the supporters of E.A.T. Such an organization cannot grant



133. Alex Hay, *Grass Field*, in "9 evenings: theatre & engineering," October 13–22, 1966.

materials or money, though it can direct artists to possible sources for both. Further, there are substantial blocks, both psychological and intellectual, among the engineering professions and industry against supporting the seemingly frivolous and illogical ideas of artists. Some engineers connected with E.A.T. have undergone real personality changes, while the artists involved have gained a new respect for technical ability. Money, public and commercial support for E.A.T. have not come easily. The basic conservatism of these factions is responsible, but very slowly Klüver and other E.A.T. personnel have convinced important groups that the ultimate purpose of the relationship is potentially more than another artists' caper (*E.A.T.*, June 1, 1967, p. 4):

> The possibility of a work being created that was the preconception of neither the artist nor the engineer alone is the raison d'être of the organization. The engineer must come out of the rigid world that makes his work the antithesis of his life and the artist must be given the alternative of leaving the peculiar historic bubble known as the art world. The social implications of E.A.T. have less to do with bringing art and technology closer together than with exploring the possibilities of human interaction.

Beyond its many shortcomings, E.A.T. represents the desire to create a professional and social rapport between artist and engineer more complete and more realistic than anything attempted in the past. Ideally, the organizers of E.A.T. would let it dissolve itself in a few years. This would not be because of failure but because the ties between the artistic and technical world had become secure enough to no longer need a parent organization. One would suppose that this is mainly wishful thinking, except that the knowledge that there is desperate social need for a symbiotic fusion between art and technology is almost a religious conviction on the part of E.A.T. The implicit belief is there that a dehumanized scientific technology cannot help but destroy itself—and the world around it.

While the "9 evenings: theatre and engineering" occurred in three dimensions, little of it could be equated with the modern sculpture which filled the same space in 1913. In the fall of 1966 there were no "sculptures" to be seen—objects that spatially and optically preserved their own presence—but instead, a variety of electronically accentuated "events." Even Steve Paxton's inflated plastic forms through which the crowds passed to get to their seats were, at best, what might be called provisional sculpture. This suggests that systems-oriented art—dropping the term "sculpture"—will deal less with artifacts contrived for their formal value, and increasingly with men enmeshed *with* and *within* purposeful responsive systems. Such a shift should gradually diminish the distinction between biological and non-biological systems, i.e., man and system as functioning but organizationally separate entities. The outcome will neither be the fragile cybernetic organisms now being built nor the cumbersome electronic "environments" just coming into being. Rather, the system itself will be made intelligent and sensitive to the human invading its territorial and sensorial domain.

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NEW YORK TIMES, OCTOBER 11, 1967

Art and Science Proclaim Alliance in Avant-Garde Loft



The New York Times (by Neal Boenzi)

Dr. Billy Klüver, electronics engineer specializing in laser research, arranges helium-filled pillows.

By HENRY R. LIEBERMAN

In a sound-drenched Lower Manhattan loft building that was enlivened by revolving painted disks, film projections, floating pillows and miniskirted girls in paper smocks, representatives of industry and labor joined a number of artists and scientists yesterday to proclaim a "working alliance" between art and technology.

This modest and uncertain merger seeks to bridge the gap between the two worlds. It is intended to bring modern technological tools to the artist for creating new art forms and fresh insights and viewpoints to the engineer for creating a "people-oriented" technology.

The event was celebrated at a news conference "happening" in the six-story loft building at 381 Lafayette Street used for studio purposes by Robert Rauschenberg, the avant-garde artist.

Kheel's 'Biggest Mediation'

Mr. Rauschenberg, along with Dr. Billy Klüver, an electronics engineer who is specializing in laser research at the Bell Laboratories, and Theodore W. Kheel, the lawyer-labor mediator, are prime movers in the art-technology merger.

"For me," said Mr. Kheel, "this is the biggest mediation I've ever undertaken."

Among the art objects on display was a large drawing of a nude generated by a computer. Masterminded by two engineers, L. D. Harmon and K. C. Knowlton, this project involved the making of a transparency from a photograph and scanning it with a device operating like a television camera.

The information on the transparency was then stored on magnetic tape in the form of pulses standing for digits, with the brightness level of the picture elements represented by numbers ranging from 0 to 7. After processing all the numbers, the computer printed a drawing of micropatterns formed by clusters of symbols used in electronic design.

Visitors at the studios were intrigued by a sculptural representation of a woman taking a shower. As droplets of water dripped from the shower-head in a white stall, moving-picture images of the woman were registered by a projector behind the stall on a sand-blasted Plexiglass panel.

Rauschenberg's 'Oracle'

Another sculptural construction was a sound-emitting assembly consisting of a tire, truck door, window frame, bathtub and air vent. This is Mr. Rauschenberg's "Oracle."

Five radios are used, with the tuning dial of each being rotated by motor. Thus, each radio picks up snatches of the broadcasts of all the local radio stations. To eliminate wiring from assembly components to the central pick-up point, signals from the radios are relayed to the components by small FM transmitters.

Last year an artist-engineer collaboration called "Nine Evenings: Theater and Engineering" left the art critics bewildered. A few visitors at the Lafayette Street show also looked with puzzlement on "Oracle." But the show sponsors emphasized that it was the idea of collaboration, and not a specific art work, that counts most.

Contributions Are Listed

While 20 helium-filled pillows floated eerily in a two-story room called "the Chapel," the need for bringing artist and technologist together was stressed in speeches by Senator Jacob K. Javits, a traditionalist who sees merit in modern art; Ralph C. Gross, president of the Commerce and Industry Association; Edwin Langsam, film projection supervisor of the American Telephone and Telegraph Company; Herman D. Kenin, head of the A.F.L.-C.I.O.'s new Scientific, Professional and Cultural Employes Council, and Dr. Warren Brodey, a psychiatrist, of the Massachusetts Institute of Technology.

A.T. & T., the International Business Machines Company, the Atlantic Richfield Corporation and various labor groups are among the organizations that have made $1,000 contributions for furthering the cooperation between artists and engineers. But Mr. Gross urged industry to enlarge "the less than 3 cents of each corporation-dollar that goes to the arts."

"Along with its obligation to be a profit-maker for its owners, the modern business corporation has an obligation to be a good citizen in the community," he said. "As a basic part of this obligation, the corporation must examine carefully its responsibility to support the arts."

In explaining the unions' interest in art and engineering, Mr. Kenin, who is head of the musicians' union, said that union members were concerned about a "growing chasm" between disciplines, the "growing impersonalization" of work and the frustrations faced by many individuals in seeking to make "valuable contributions."

He noted that union members were also consumers, members of audiences and citizens concerned with the quality of society.

The event served to dramatize a drive to win organizational support for the art-technology merger and to mark the transfer of Experiments in Art and Technology, Inc., a nonprofit organization of artists and engineers, to the new Automation House being prepared at 49 East 69th Street.

Automation House will be the center of the American Foundation on Automation and Employment, headed by Mr. Kheel and concerned with human problems caused by automation — notably the problem of individual "isolation."

Dr. Brodey, who heads M.I.T.'s science camp for underprivileged youngsters, noted that new technologies had opened large new areas of creativity. While the industrial revolution "averaged the people," he said, the great strides made in science and engineering had opened "a new potential for living in a personalized environment if we merely can think our way out of the old mass-production mentality."

He added:

"It is the artist who has the capacity to make personalized products that grow in meaning as they become more familiar. The artist has learned to use as his material the familiar that is outside the 'accepted system.' By his slight shifts, relevance and meaning emerge from the hackneyed."

Dr. Klüver, the laser specialist, stressed his belief that the art-technology merger should primarily be aimed at "catalyzing the individual's responsibility for the shaping of the new technology." In pursuing this end, the 40-year-old scientist, a thin, blond man who came here from Sweden in 1954, has long assisted artists in developing new modes of expression.

A Natural Marriage

He has advised sculptors on how to build self-exploding contraptions, helped painters add neon lights and motors to their works, and provided them with amplifiers, oscillators, speech synthesizers, image producers and various kinds of electronic detectors to extend their range. To Dr. Klüver, it is a natural marriage.

Technology supplies new materials, new techniques and new imagery to the artist. In return, technology gets from the artist new outlooks that make it "more human, more reasonable, more varied, more lifelike, if you wish."

Robert Rauschenberg, the 41-year-old soft-spoken ex-Texan who has been called an artistic enfant terrible, agrees that technology has bountiful gifts to offer the artist. Far from fearing it, he finds it an "exciting challenge."

'No Place Is Safe'

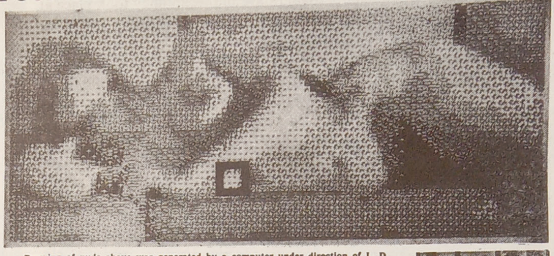
"If you don't accept technology you better go to another place because no place here is safe," he said. Asked what made technology so exciting for him, he replied: "Nobody knows the kind of art that will be created if two or three men in diverse fields become collaborators."

About 370 artists already have written to Dr. Klüver and Mr. Rauschenberg seeking technical assistance for projects they have in mind. The letters include requests for information on synthetic fabrics, pigments, enamel finishes, translucent spheres, micro-organisms, electromagnetics, "slow chemical destruction of objects," extending the range of sensory perception" and an "efficient way" to make paintings appear and disappear.

Mr. Rauschenberg himself has a project in mind with problems that he has not yet been able to solve technically. He envisages a room that would be responsive to weather, to people viewing it, to traffic noise and light."

This he sees as the art of the future.

"Nobody wants to paint rotten oranges anymore," he said.

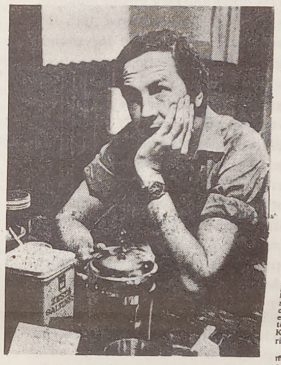


Drawing of nude above was generated by a computer under direction of L. D. Harmon and K. C. Knowlton, engineers. Black square encloses the detail shown.





Jacob K. Javits scrutinizing yesterday at gathering at 381 Lafayette Street. A traditionalist, the New York Republican nevertheless finds merit in modern art.



Robert Rauschenberg, the artist, says, "If you don't accept technology, you better go to another place."

WALL STREET JOURNAL, OCTOBER 21, 1967 EXCERPT

Art & Technology Make It Official

By JOHN J. O'CONNOR

NEW YORK—Yesterday, at artist Robert Rauschenberg's four-story house in lower Manhattan, there was a simple announcement that contains the seeds of a complex revolution for the corporate and societal structure of this country.

The gist: Take the oil of the technologist, combine with the vinegar of the artist, season liberally with industry aid, and you get the makings of a research and experiment collaboration that has long been discussed in utopian musings but has never come near practical reality.

The surprising ingredient is the cast of characters: A long list of artists, famous and not so famous; an equally long list of interested and willing scientists; corporate giants such as American Telephone & Telegraph and International Business Machines, smaller firms like "Automatic" Sprinkler and Essex Wire; and, far from least, the AFL-CIO.

The catalyst for all this is an organization called Experiments in Art & Technology Inc. E.A.T. grew out of an extraordinary series of performances given last year under the title "Nine Evenings." Put on through the efforts of a number of avant garde artists and a group of scientists working primarily at AT&T's Bell Laboratories, "Nine Evenings" proved to be one of the most controversial and indisputably stimulating events of the season. It attracted a total audience of 10,000 persons.

Following the event, a few of the people involved — primarily Mr. Rauschenberg and Billy Kluver, a scientist at Bell Labs—decided they would work toward an even wider and, if possible, permanent collaboration between the scientist and the artist. As the result of a subsequent meeting to see if there was any interest on the part of the artists in pursuing this goal, 200 detailed replies were received from artists all over the world who in one way or another were seeking scientific help.

Medium and Message

But Mr. Kluver is at pains to make it clear that E.A.T. was created for the benefit of the artist. The product is the collaboration itself, an obvious manifestation of Marshall McLuhan's observation that the medium is the message. The "technology gap" has been widening over the past several years, to the extent that not only doesn't the general public fully comprehend the significance of the newer developments but too often isn't even aware of what is readily available for practical application.

Mr. Kluver's aim is on the one hand to put this technology at the practical disposal of the artist, to open the windows of the legendary garret, and on the other to expose the technologist to the imagination of the artist, to air out the mustiness of the laboratory. With this in mind he set about enlisting the essential support of industry.

The relationship between business and the arts has been growing steadily closer, of course, in the past several years. Frequently the reasons have been too casually dismissed as being nothing more than that industry enjoys the status of getting mentioned in a playbill or art catalog while art is only too willing to pick up an available dollar. On closer examination one finds things go a good deal deeper. With the advances in higher education in this country, there has grown an awareness of the obeisance that must be paid to culture—and be paid to all its aspects.

As for the supposed hostility or mutual lack of understanding invoked in describing the relationship of the artist and the scientist, the collaboration of Mr. Kluver and Mr. Rauschenberg stands as a neat refutation. Admittedly, Mr. Kluver is not the ordinary scientist; he has long been associated with vanguard movements in the field of art and the dance. And Mr. Rauschenberg is no ordinary artist, winner of the Venice Biennale first prize in art a couple years ago, he hasn't hesitated to venture into different fields with composer John Cage and choreographer Merce Cunningham.

In their efforts to enlist the aid of industry, however, both men are unstinting in their praise of a third figure, Theodore Kheel, a lawyer who has gained a nationwide reputation as an able labor mediator. Mr. Kluver feels that it wasn't until Mr. Kheel came on the scene last June that the proposed program began to make headway. It was then that the enormous practical difficulties of reaching presidents and boards became less imposing.

'Automation House'

Mr. Kheel also lent something more, his own personal enthusiasm. Through his efforts the support of the AFL-CIO was obtained through its Council of AFL-CIO Unions for Scientific, Professional and Cultural Employees. The union's "Automation House," which is now being assembled in a mid-Manhattan mansion as a laboratory with the latest equipment to deal with the problems of job dislocations from automation, will be made available to E.A.T. for experimental work, seminars and performances.

"Patrons of the E.A.T. program do not have to make any large initial financial outlay. Dues amount to only $1,000 annually. What is significant is the commitment.

"Aside from the companies already mentioned, negotiations are being conducted with several more and, so far, within the AFL-CIO the unions of the machinists, maritime and transport workers have signed up as individual patrons.

Can there be any immediate practical benefits for the companies? Mr. Kluver speculates that for one thing, the program might help arrest the high turnover of scientists and engineers that plagues corporations. He says the time for building another company golf course as an enticement to the staff has long passed.

And for labor? Mr. Kheel is well aware that the traditional arguments to the working man—higher wages and shorter working hours—are not as effective with the younger generations. He sees E.A.T. as a strong potential for developing newer attractions.

AFL–CIO NEWS, WASHINGTON D.C., OCTOBER 21, 1967

New Frontiers in Culture:

Labor, Industry Encourage Merger of Art, Technology

New York—A program to team artists and engineers on specific cultural projects related to the world's advancing technology was announced here with the joint support of labor and management.

Allied in the program are the American Foundation on Automation & Employment, Inc., and Experiments in Arts & Technology, Inc. Both groups are non-profit organizations broadly representative of industry and labor.

The foundation, whose co-chairmen are Pres. P. L. Siemiller of the Machinists and Vice Pres. Frank Gallucci of Essex Wire Corp., was set up in 1962 with the goal of encouraging the use of automation while seeking solutions to the employment problems it creates.

EAT, headed by Dr. William Kluver, an electronics engineer specializing in laser research at the Bell Laboratories, was recently established "to catalyze the interaction of industry, technology and the arts" by encouraging and helping artists and scientists to collaborate on specific projects. It has already received more than 300 applications for such aid.

Pres. Herman Kenin of the Council of AFL-CIO Unions for Scientific, Professional & Cultural Employes is a member of the EAT executive board, as is New York Arbitrator Theodore W. Kheel, president of the foundation. Pres. Harry Van Arsdale, Jr., of the York City AFL-CIO is on the EAT advisory committee.

Alliance Announced

Kheel and Pres. Kluver, announcing the alliance of the two groups at a press conference here, said both organizations have similar objectives in that they "seek to enhance the contribution the new technology can make in providing individuals in our society today with "new opportunities for self-fulfillment."

The foundation, they noted, addresses itself primarily to the business or industrial worker, whereas EAT is concerned about "the separation of the artist and the engineer when both have much to contribute to each other."

Kenin, who is president of the Musicians and an AFL-CIO vice president, said union members represented by the SPACE council are concerned "as practitioners in the arts and sciences . . . about the growing chasm between the disciplines . . . the growing impersonalization of their work" and "the frustrations they face in attempting to employ their knowledge and talents in making . . . a valid contribution to our civilization."

He stressed, too, the role of union members as consumers and audiences concerned with "the quality of the society to which they are asked to contribute their knowledge and talents."

EAT Vice Pres. Robert Rauschenberg, one of the nation's foremost artists who has made extensive use of machinery and electronics in sculptural assemblies, said he views the alliance of art with technology as "an exciting challenge."

"Nobody knows the kind of art that will be created if two or three men in diverse fields become collaborators," he observed.

Artists already have sought EAT's aid in solving problems involving synthetic fabrics, pigments, enamel finishes, translucent spheres, micro-organisms, electromagnetics, and "the range of sensory perception."

Works displayed at the press conference included a large drawing of a nude produced by a computer from information gathered from a photo transparency by a scanning device and stored on magnetic tape.

EAT will make its headquarters in the foundation's new building at 49 East 68th St., to be known as Automation House. An immediate objective is collaboration between the two groups to make Automation House a showcase for the merger of the arts and technology.

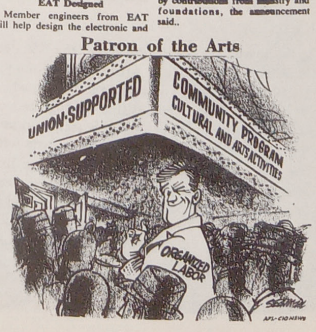
The announcement said Rauschenberg will head a team of artists working with the foundation's architect, Richard D. Kaplan, in designing the building as a center of communications employing the latest electronic equipment and building materials in functional art forms.

EAT Designed

Member engineers from EAT will help design the electronic and technical installations, which will be used by both EAT and the foundation-sponsored Institute of Collective Bargaining and Center for Job Training Information. Automation House also will be used to display art work produced by artist-engineer teams.

In addition, the foundation will aid EAT in fund-raising and administration. Kheel and Dr. Kluver said EAT will have an annual budget of $100,000 financed by annual dues from individuals, corporations and labor organizations. Specific projects involving artists and engineers will be underwritten by contributions from industry and foundations, the announcement said.

Patron of the Arts



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BUSINESS WORLD, OCTOBER 21, 1967

Science for art's sake

New York group asks companies to let their scientists collaborate with artists in using new materials, techniques

As contemporary artists get farther and farther out in their choice of media — plastics, flashing lights, exotic alloys, tape recorders, films— they are beginning to feel limited by their ignorance of the technological tools they must master.

Now, thanks to a group called Experiments in Art & Technology, Inc. (EAT), industry is coming to their aid. EAT is asking its industrial sponsors—they include AT&T, IBM, "Automatic" Sprinkler Corp., Essex Wire, and Atlantic Richfield—to supply lists of scientists on their staffs who are interested in working with artists in need of technological help.

Payoff. "For the scientist, the payoff is new insights and an added human dimension to his work," says Dr. Billy Kluver, a physicist with Bell Telephone Laboratories.

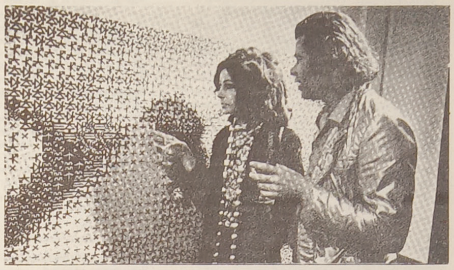
There's a dividend for the companies, too. According to Kluver, any commercial discoveries resulting from EAT projects will be assigned to the sponsor supplying the engineer involved. One such discovery—a fluorescent chemical used in a theatrical presentation—has now been adapted by Bell Labs engineers as a tool in laser research.

Support. A group of artists, businessmen, engineers, union leaders, and reporters converged last week on the Manhattan studio of avant-garde artist Robert Rauschenberg—who with Kluver founded EAT—to drum up support for the organization. Sipping drinks served to them by girls attired in scanty paper dresses, they nodded in enthusiastic agreement as speakers extolled the new alliance of art and science.

Among the speechmakers were New York Senator Jacob Javits, labor arbitrator Theodore Kheel, Dr. John Pierce, head of Bell Labs, and MIT psychiatrist Warren Brodey. Lamenting the absence of joy in modern life, Brodey proclaimed: "Most of us are caught in an automated traffic jam, surrounded by meaningless stimuli. We need a fresh perspective."

Examples of that fresh look—new art forms that already had resulted from collaboration between artists and scientists—were on display in Rauschenberg's studio. They included whirling plastic disks with flashing images, a tennis racket wired for sound, an oil painting with neon lights, and a drawing of a nude generated by a computer. And, floating above the speakers' heads were several helium-filled silver pillows devised by pop artist Andy Warhol.

As the speeches progressed, the technological problems that can arise in new art forms were vividly illustrated as Warhol's pillows drifted gradually to the floor. The effect, explained an engineer, was due to the rising temperature in the room caused by the crush of people.



Computer drawing of nude torso drew critical acclaim of avant-garde artists

NEW YORK TIMES, NOVEMBER 12, 1967

EXPERIMENTS IN ART AND TECHNOLOGY ANNOUNCES A COMPETITION FOR ENGINEERS AND ARTISTS AND REQUESTS SUBMISSION OF WORKS OF ART MADE IN COLLABORATION TO BE SELECTED FOR AN EXHIBITION AT THE MUSEUM OF MODERN ART, NEW YORK CITY

The Museum of Modern Art, New York, has asked Experiments in Art and Technology to collaborate on a section dedicated to new technology in art as an extension of a major exhibition entitled THE MACHINE, to be held in the fall of 1968 and directed by K. G. P. Hulten, Director of Moderna Museet, Stockholm. The main body of the exhibition will be an historical survey of works of art commenting on the machine and the mechanical world.

Works to be considered for inclusion in the exhibition should be submitted by June 1, 1968 to Experiments in Art and Technology.

Experiments in Art and Technology is established to develop an effective collaboration between engineer and artist. The raison d'etre of Experiments in Art and Technology is the possibility of a work which is not the preconception of either the engineer or the artist but which is the result of the exploration of the human interaction between them. To encourage this aim in the works to be considered for the exhibition, Experiments in Art and Technology announces a competition for the best contribution by an engineer to a work of art produced in collaboration with an artist. The project may be initiated by either an artist or an engineer.

Experiments in Art and Technology will grant a first-place award of $3,000 and two second-place awards of $1,000 each to the engineer for his technical contribution to the collaboration. The jury will consist of scientists and engineers from the technical community who are not necessarily familiar with contemporary art. The jury will not be informed about the names of the collaborating enigneers. The awards will be for the most inventive use of new technology as it evolves through the collaboration of artist and engineer.

Final selection of the works to be shown at the Museum of Modern Art will be made by Mr. Hulten in consultation with the Jury.

Experiments in Art and Technology will help interested engineers and artists to establish contact. Engineers or artists who find the competition and the exhibition of interest should contact Experiments in Art and Technology at 9 East 16th Street, New York, New York, 10003. The Exhibition is international.

PIONEER, COOPER UNION, NOVEMBER 17, 1967

COMPETITION OFFERS PRIZES FOR BEST JOINT ENGINEER-ARTIST PROJECTS

An organization known as Experiments in Art and Technology announced last week a competition for the best work of art produced by collaboration of an engineer with an artist. A first-place award of $3000 and two second-place prizes of $1000 each will be granted, and works of art selected wil be included in an exhibit at the Museum of Modern Art in the fall of 1968.

This organization is dedicated to developing meaningful, mutually-contributive working relationships between artist and engineers in the belief that such joint efforts will benefit society as a whole. Historically, technology and the arts have progressed insulated from one another. E.A.T. attempts to pierce this traditional isolation by bringing these two fields together in individual projects, thereby affording to the imagination and creativity of the artist a previously untapped wealth of tools and methods for new art forms, while in turn the engineer would be exposed to fresh insights and viewpoints for developing a more human, people-oriented technology from the stifling and complex one he works with.

E.A.T. itself developed from a collaborative effort between artists and engineers. Following a series of performances entitled "Nine Evenings: Theatre and Engineering," the result of ten months work of ten artists and 40 engineers, several of those involved decided they would work toward a wider and more permanent cooperation between engineer and artist. Subsequent meetings showed that nearly 300 artists were immediately interested and were seeking scientific help for projects they had in mind.

Up to the present, E.A.T. has received over 370 requests for technical assistance from artists, including requests for information on synthetic fabrics, pigments, enamel finishes, translucent spheres, micro-organisms, electromagnetics, "slow chemical destruction of objects," extending the range of sensory perception, and an "efficient way to make paintings appear and disappear." Engineers have already advised sculptors on building self-exploding mechanisms, painters on how to add neon lights and motors to their works, and have provided other artists with amplifiers, oscillators, speech synthesizers, image producers, and various kinds of electronic detectors to extend their range.

Presently, E.A.T., with its list of artists requesting technical information, and of interested engineers, is acting as a sort of "matching agency" where an artist with a problem is put in contact with a member engineer who is qualified to deal with the artist's specific problem. The success of the collaboration, then, depends on the individuals involved. Experiments in Art and Technology eventually hopes to promote such an understanding between artists and engineers such that there result works which are not the preconception of either, but rather the result of the human interaction between them.

To the organizers of E.A.T increased contact between art and technology is totally worthwhile because of the potential social and cultural consequences, which each field can derive from the other.

BELL TELEPHONE MAGAZINE, NOVEMBER/DECEMBER 1967

Art and Science: Two Worlds Merge

Through centuries of civilization, the artist has used technical knowledge, but now scientists are finding that working with artists can broaden their own thinking in creative technology.

In this day of intensifying specialization, people often think of art and science as two completely disparate, even mutually exclusive, disciplines — areas of human endeavor as opposite as poles of the earth. And yet, a new affinity between the two is drawing together people who, until recently, might never have met. It is as though the rivers of science and art have reached a point of confluence where scientist and artist are intermixing in a mutually fruitful exchange of ideas.

Active in this confluence are a number of men at Bell Telephone Laboratories. What they are doing and their reasons for collaborating with artists are as diverse as the technical projects they are working on. Equally diverse are their feelings about interaction with the artist. Their point of agreement is that they all feel it is growing, that it is important, that technology contributes to art and that art is, and may become even more important to technology.

At Bell Laboratories, scientists studying the fields of speech, hearing and visual perception have become absorbed in the world of the artist in many ways directly connected with their work. Much of this scientific exploration enlists the aid of the computer, which is becoming more and more useful as a graphic tool not only in research but also, somewhat unexpectedly, in creating new art forms.

Occasionally, basic research has led to artistic by-products from the scientists themselves. The "sculptures" of A. Michael Noll, which were exhibited at the Howard Wise Gallery in Manhattan, grew out of his research into computer-generated three-dimensional graphs and movies that compare mathematical models with reality and depict phenomena that are not directly observable. The precedent for this was Mr. Noll's creation of moving or "kinetic sculptures," which are made by describing their shapes and dimensions in numbers. He has also programed the computer to generate drawings composed of quasi-random elements in the style of abstract painter Piet Mondrian.

Obviously excited by the computer's possibilities as an artistic medium, Mr. Noll envisions the artist of the future working with the computer by direct man-machine interaction. "The creative potentialities of the computer result in a totally new kind of artistic medium — a creative medium with which the artist can interact," he says. "The potential of such a medium as collaborator with the artist is truly exciting."

Also exhibited at the Howard Wise Gallery was work done by Bela Julesz, who is concerned with basic research in visual perception at Bell Labs. He has created a computer movie of random patterns with texture which dramatizes visually the relationship between textures of physical objects and perception of their shapes.

The difference is motivation

Mr. Julesz says, "When the scientist starts to see that some of his creations become artistic and are accepted at more than their scientific value, as a piece of beauty, it's an unusual experience. While these computer movies were intended for a study of visual perception, not as art, I think that visual perception is historically a common area for both the artist and the scientist, a common intersection where there is no gap or artificial bridge. The same kinds of things can be artistic or scientific; the only difference is the motivation.

"The artist is searching for an artistic truth, an intimate truth he wants to convey," Mr. Julesz goes on, "and I am searching for a scientific truth, which is testable and very defined. The artist is also interested in solving problems, and the computer might be a common tool to bring us together because it helps to execute the problem. It has made us more aware of the interaction between science, technology and art."

Kenneth Knowlton, another scientist at Bell Laboratories, has specialized in computer-produced motion pictures. He has devised a special programing language called BEFLIX, which permits the technologist to present a visualization of what he wants to explain. In collaboration with film maker Stan Vanderbeek, Mr. Knowlton has produced a one-minute film, "Man and His World," which, without story line, is a series of patterns with color background, created entirely by the computer.

Of this collaboration, Mr. Knowlton says, "It is teaching me something about art, about expressing myself, freeing up my own thinking so that I no longer think in nearly so stereotyped a way about the computer and the things one can do with it. Stan Vanderbeek has been using the BEFLIX movie language extensively; he is learning programing techniques so that he can push ahead with experimental computer movies."

Mr. Knowlton considers that Vanderbeek's experience in presenting things visually through his films has helped in producing technical movies with the computer. "Vanderbeek thinks in visual terms," says Mr. Knowlton. "He's interested in color, motion, after-images, patterns; in making a film he has to consider all these. When I began making films with the computer I was not aware of these considerations Vanderbeek is teaching them to me — I now appreciate their importance in communicating visually, whatever the content of the film. I think that any scientist using the computer to make movies can profit from the seasoned film maker's knowledge and experience."

While these men — Noll, Julesz, Knowlton, and others at Bell Laboratories — in the course of their research have produced computer-generated images of artistic merit and interest, their primary objective still is research. Specifically, they are concerned with exploring the computer's manifold capabilities and its potential uses as a research tool. For example, Frank W. Sinden, a colleague at Bell Laboratories, has produced a series of computer-generated movies which attempt to isolate those three-dimensional effects that we detect entirely through motion or time sequence. As these researchers point out, their experience with the artist's point of view has provided a useful feedback into their own work — a kind of yeast in the cake of pure science. But the ultimate value of this experience, for them, will lie in its stretching of the horizon of research.

Translating movement into sound

Manfred Schroeder, director of Bell Laboratories' acoustics, speech and mechanics laboratory, a year ago participated in an experimental entertainment called "Nine Evenings: Theater and Engineering." It was a collaborative project between dancers, artists, musicians and technologists. Engineers and scientists at Bell Laboratories contributed their technical expertise, working on their own time, to produce a fusion of music, painting, dance, abstract sound, film and live television.

"I became involved," says Mr. Schroeder, "because I am familiar with all kinds of sound effects. Acoustics

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BELL TELEPHONE MAGAZINE, NOVEMBER/DECEMBER 1967 CONT'D.

is my speciality, and part of the endeavor here was to integrate acoustic effects into these performances. Dancer Lucinda Childs was asking for things to translate body movements directly into sound, so that she could actually create her own accompaniment as she danced. We came up with a device that reflected ultrasonic waves from her body, then converted them to audible sound. I got the idea from work I'd done years ago on stabilizing public address systems, and feedback problems with the Speakerphone, which under certain conditions produced howling or singing noises. It wasn't a very interesting sound. But while we were working with it we discovered that it would make all kinds of funny sounds if you did the right things to it and if people walked through the room. When Miss Childs made her request, I remembered that work. But," he adds, "it needed some artistic concept to make it worthwhile and enjoyable."

Mr. Schroeder considers that such new uses of technology have a real future in artistic expression. "We certainly have a great storehouse of scientific information that would allow us to produce a variety of acoustical and visual effects. For example, we could have sounds whirl around in space, or we could have this translation of movement into sound, or light into sound, or sound into light."

Computers could simulate dancers

"We could use digital computers to simulate a certain effect. One could write a computer program to simulate not only one dancer and a microphone, but also do the same thing for a troupe of 50 dancers. We could give the choreographer knobs on the computer console to change the movements of the dancers and hear the differences in sound — give him the possibility of altering his original idea."

Although he thinks of himself specifically as an engineer, in connection with "Nine Evenings" Mr. Schroeder foresees a more intimate interaction between art and engineering in the future. "I think it is quite conceivable," he says, "that we will have mixed personalities here, that artists in these fields will emerge from the engineering profession."

Another of the people at Bell Laboratories who has been actively engaged in collaboration with artists is Billy Kluver, who conducts laser research in the Physical Optics and Electronics Research Department. Mr. Kluver has worked with way-out kinetic sculptor Jean Tinguely, sculptor and film maker Andy Warhol, painter and sculptor Robert Rauschenberg, composer John Cage, painter Jasper Johns, and others. He was a major motivating force behind the "Nine Evenings" project and worked with its performers in his spare time. While the show's mixture of sound, light and motion effects never before heard or seen evoked mixed responses from audiences, Mr. Kluver considers it a fruitful experience for all concerned.

The common ground where engineer and artist meet is illuminated more clearly when Mr. Kluver speaks of his own involvement. "The artist's work is like that of the scientist; it is an investigation which may or may not yield meaningful results.

"The artist and the scientist both work with the world around them; their perception of this world is their material. Their differences lie in the way in which they use this material. The scientist must build on and include previous scientific knowledge in his work. The artist, once he has made his choice as to the essential character of his work (be it painting, sculpture, music), will make every effort to avoid easy associations or connections with other works of art or other known fields of human activity. When you see a good work of art for the first time, it gives you the feeling of not relating to anything else you know — yet you are forced to become aware of it. I am interested in art as an engineer, not as an artist."

From his own experience as a technologist working with artists, Mr. Kluver says, "You do things you wouldn't normally do, because you're in touch with a mind whose vision is totally different from yours. The artist's vision and concern relate to other aspects of human activity, and that's the end that particularly interests me. I'm not so much interested in helping artists as I am in seeing what effect the artist could have on technology. In the future, I see the artist having more and more impact, as he learns more about technical processes. The contribution of the artist could conceivably lead to an increased awareness, a new view of the problems the engineer, designer, scientist has to deal with. For instance, it might reflect on questions like: What should the next mass media look like? We will have the megalopolis; what is it going to look like? I think that the main influence of art and technology together will come in the area of environment."

By-products of research

It is perhaps in the field of sound — especially computer-produced sound — where the interaction between artist and technologist has been closest. Sound and music created by the computer are by-products of research in new techniques for transmitting voice and music over telephone and other communications systems. The potentialities of this "machine music" are being examined by many musicians and mathematicians at Bell Laboratories and elsewhere, including MIT, Princeton University, Stanford University, UCLA, and the Argonne National Laboratory.

Among those practicing musicians who have come to Bell Labs for aid in their explorations are Gerald Strang, member of the Music Department in the California State College system; composers Milton Babbitt and James Randall of the Princeton University music faculty; Vladimir Ussachevsky of Columbia University; and James Tenney of Brooklyn Polytechnic Institute. There were also the late Edgar Varese and Herman Scherchen.

Meanwhile, some Bell Laboratories researchers have themselves become composers, including John R. Pierce, executive director of the Research Communications Sciences Division, Max V. Mathews, director of the Behavioral Research Laboratory, and Newman Guttman, formerly of Acoustics Research.

Mr. Pierce, who is a writer of both fiction and articles, and a poet as well as a composer, says of his first adventure in computer music, "The first computer-played music was composed by Newman Guttman and programed by Max Mathews as an experiment in producing and using certain voice and other sounds. It was just a little flyer. I wondered whether a computer had to sound like that, or whether it was what Newman had done. So I dug out a very short little conventional piece that I had composed and ran it through the computer, and it sounded more like conventional music."

New insights into acoustics

Pierce and Mathews started using the computer to make "musical sounds," and that led them into amateur composing and eventually into the issuing of a record. Mr. Pierce emphasizes that it was the challenge of something new that made it exciting. "I have never untangled the art and the science in living," he says. "I certainly wouldn't have bothered to compose little ditties and I never would have gotten them on a record if it hadn't been for the computer. The only thing that led me to do this was curiosity — the chance to exploit and play with something entirely new. It was fascinating. It has inspired me, informed me."

Mr. Pierce points out that such excursions into computer-generated sound have led to new understanding of sound quality and acoustics. "Since Max Mathews and I devised various ways in which the computer generation of sound could be made more flexible," he says, "there has been a continued interaction among the psychoacoustics of perception, the study and production of speech, and our experiments with musical sounds.

"In my case," he goes on, "I have become more sensitive to, and have a greater appreciation of, sound quality. I've been interested in the generation of speech from phonetic symbols stored in the memory of a computer. I regard this as a very important and challenging problem in the field of man-computer interaction. Some of the experiments I have made with musical sounds have led me to believe that it will be possible to overcome the mechanical quality of computer-generated speech. Our studies of the quality of violin tones and trumpet tones are very closely related to our studies of the quality of computer-generated speech."

At present, spoken words produced by the computer are limited by the difficulty of describing the essential features of such complex sounds precisely. Here, Mr. Pierce considers the uniquely human sensitivities to be indispensable. "One of the most powerful human faculties," he says, "is that of being able to judge qualities even when we cannot measure them. Here the ear of the trained musician may be as valuable as the digital computer. We are looking for needles in haystacks, and only the sharp ears of musicians and the sharp minds of scientists will enable us to find them."

Max Mathews, a specialist in behavioral psychology, has worked with several composers in computer techniques, and has composed music himself. In particular, composers Randall, Tenney and Strang are writing music for the computer because, as Mr. Mathews says, "musicians can't play the music they write or wish to write. It is too precise and too fast, and requires things that are physically impossible." Using a sound synthesizing computer program which Mathews developed, these composers write out a score, specify the sounds they want synthesized, and the results can be heard through a loudspeaker connected to the computer as though emanating from an orchestra.

Collaboration is a two-way street

In Mr. Mathews' opinion, collaboration between artist and technologist is, in a very real sense, a two-way street. "What the technologists get out of art are the same things that anyone else gets out of art, the same thing civilization gets. These are the very important, long-range permanent values; they represent some of our best achievements."

The scientist may also derive benefits unique to his own situation. "As far as unique things are concerned," says Mr. Mathews, "this depends upon him as an individual: he may get quite a bit of inspiration; he may get new ideas; he may get some idea from the art that he can use directly in his technology. We have, certainly, examples of this in the understanding of speech and speech quality that have come out of our studies in music.

"Currently, we have been concerned with experiments on tone perception, a new theory of consonance and dissonance, which was primarily studied for music. The sounds and the percepts are the same musically and speechwise, and music is a much simpler sound source, so we can study it in greater detail and understand it better. These tonal studies have given us a new insight which we would not have gotten directly from speech because it is too complicated."

Whatever course the converging rivers of art and technology may take, it seems certain that the convergence is permanent. The new windows now being opened by science and art working together are broadening the view to the mutual profit of both.

"Deeper understanding," Mr. Pierce says, "has broken down many of the barriers between various fields of science. Perhaps this will become true of the barriers of ignorance and temperament which have divided science and engineering from the arts. This could surely open new opportunities for artists, and I really believe that it can quite as much open the eyes and ears of engineers and scientists — and even their minds."

Max Mathews emphasizes succinctly, from the scientist's point of view, what the collaboration between the scientific community and the world of art means to him: "You get inspiration from working with the artists, generally wake up. And this is one of the requirements for doing creative research — to be awake!"

It may have been the eventual fruits of such collaboration that Sir Francis Bacon had in mind when he wrote: "The real and legitimate goal of the sciences is the endowment of human life with new inventions and riches." □



Artist Robert Rauschenberg and dancer Lucinda Childs, performers in last year's "Nine Evenings" entertainment, discuss unique electronic environmental system with Bell Laboratories engineers Leonard J. Robinson and Per Biorn.

SAN FRANCISCO SUNDAY EXAMINER, DECEMBER 10, 1967

Art and Technology

Technology now totally dominates every step of everyday life. The artist's creativity is only slowly reestablishing its prestige, after having been almost wholly eclipsed by science and technology during the nineteenth century. During that time, artists lost the tradition of an understanding of materials and their capacities. Art and science, emotion and reason, became divorced and developed independently.

To confront the men who are shaping the new technology with the sense of individual responsibility and freedom that reigns in art is an important task. What must be abolished is the determinist notion that technology develops independent of the people who work with it. Since technology is nothing but a tool, it is neutral. Those who work with it must learn from artists to take full responsibility for what they do.

The international organization Experiments in Art and Technology (E.A.T.) was founded to try to establish a better working relationship among artists, engineers, and industry. In line with that purpose, E.A.T. agreed to arrange a competition in connection with the exhibition "The Machine as Seen at the End of the Mechanical Age." In response to the announcement of this competition, reproduced on the preceding page, approximately two hundred works, using a wide variety of means, were submitted from nine countries.

The jurors were: James M. Brownlow, International Business Machines Research Laboratories; Michael D. Golder, Plastic Research and Development Center, Celanese Plastics Company; Cyril M. Harris, Professor of Electrical Engineering and Architecture, Columbia University; John W. Pan, Bell Telephone Laboratories; and William G. Rosen, Special Assistant to the Director, National Science Foundation, and Executive Secretary of the Committee on Academic Sciences and Engineering of the Federal Council for Science and Technology.

In making the awards for the most inventive use of new technology as it evolves through the collaboration of the artist and engineer, the jurors were asked to base their judgments on these criteria: First, how inventive and imaginative is the use of technology? Second, to what extent have the engineer and the artist collaborated successfully?

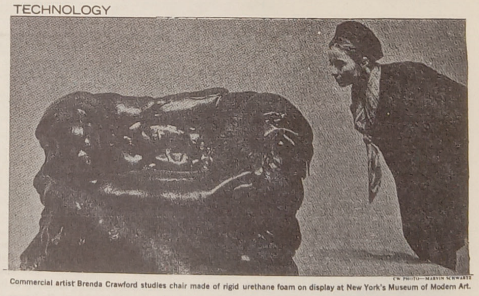
The prizes mentioned in the announcement were awarded to the following engineers for their technical contributions. Ralph Martel, first prize; Frank T. Turner, Niels O. Young, second prizes. In announcing their decision, the jurors issued the following statement:

In each of the winning entries a spectrum of technology was used with great impact on the art forms. Evident is the realization that neither the artist nor the engineer alone could have achieved the results. Interaction must have preceded innovation. Going beyond a demonstration of technical prowess or an intricate orchestration of art and technology, the engineer and artist together have created more than a well-executed realization of fantasy. The unexpected and extraordinary, which one experiences on viewing these pieces, result from inventiveness and imagination, stimulated not by the brute force of technical complexity but by probing into the workings of natural laws.

In advance of the jury's deliberation, the director of the exhibition had already made a preliminary selection of nine works from the competition; they are documented on the following pages. Some very interesting environmental works, including entire rooms, unfortunately had to be excluded from consideration because of their size and the limited space available. When the jurors' decision was announced, it was remarkable that their awards should have gone to three of the nine works already selected.

CHEMICAL WEEK, DECEMBER 9, 1967

TECHNOLOGY



Commercial artist Brenda Crawford studies chair made of rigid urethane foam on display at New York's Museum of Modern Art.

Wanted: new art materials

Today's free-wheeling sculptors have already adopted polystyrene, acrylics, urethane foams and other new plastics but, like many an industry product development man, they want more and better. And they have now organized to get what they want.

At a recent party in the downtown New York six-story studio of artist Robert Rauschenberg, he and Bell Laboratories engineer Billy Kluver, together with lawyer-labor mediator Theodore Kheel, launched an organization called Experiments in Art and Technology. Said electronics engineer Kluver: "We feel that artists have much to contribute to industrial technology, just as artists have much to gain by an understanding of available new materials for their work."

The new organization, headquartered at 9 East 16th St., aims to bring the two worlds closer together.

Flying Plastics, Fading Paints: A few days after the avant-garde party, Kluver detailed for *CW* the kind of currently unavailable materials today's op-pop artists are pining for.

High on the list are really clear epoxies that don't discolor. And several sculptors are looking for low-density styrofoams that could be impregnated with helium. The goal: truly free-floating sculptures that would hover above the floor without needing stands or sustaining wires.

Then there are the painters who, unlike their Renaissance predecessors, would like their works of art to disappear gradually into the canvas. Kluver thinks vanishing pigments might also be useful for posters that could be painted on building walls, disappear in a month or two when the message was no longer germaine.

And, not to be outdone, a sculptor is looking for some safe corrosive that, when incorporated into the modeling material, would gradually eat the artifact away. Another has a yen for sheets of polyethylene-like material that would have enough elasticity to be continually deformed and reformed by some device.

The Chair That Flows: Not all of the ideas demanding new chemical technology are so far out.

In an exhibit of new designs for household furniture at New York's Museum of Modern Art there is an easy chair made of rigid urethane foam that looks like nothing so much as a dark chunk of melted caramel (*photo, above*). Laid up glob by glob at the Dansk Polyether Industrie (Copenhagen) by designer Gunnar Andersen, the easy chair wouldn't look so melted if the urethane set faster. Andersen is a devotee of "soft sculpture" and like most moderns abhors the notion of working with molds. But to avoid them, he needs quicker-setting plastic.

As citizens of Chicago's Loop gazed in puzzled awe at Picasso's giant ruddy metal monster astride the Civic Center plaza and as New Yorkers did the same for dozens of plastic, iron and aluminum fabrications all over town, it was apparent that the new sculpture is burgeoning. Plastics makers and finish formulators take note. It's what's happening. *END*

IEEE SPECTRUM, DECEMBER 1967

Engineering and art. It is high time that so
futed the notion that art and engineering are a
Too often I have heard it said that engineer
and unfeeling, or even depressing; that the eng
his slide rule and transit, his concrete and st
wires and electrons does not appreciate the "fin
that his works are without aesthetic value.
Could it be that the authors of such rema
comprehension of some of the most beautiful a
elements of human experience? Surely, they do
stand the forces that motivate most of us, or
the pervasiveness of art. They do not like wh
not understand.
I have never found a widely accepted definit
If we believe that "art is creation for (aesthetic
tion," or "the application of ingenuity to
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of creative experience and must include our own
Indeed, are we not surrounded with examples o
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creations—the Golden Gate Bridge, the Eiff
the F-11 jet, or the 1903 Oldsmobile? Some o
examples of modern art are created in our
Have you ever looked closely at a thin-film
circuit or a thyratron in action?
But man's most beautiful creations are not
They are to be found in the conception of ideas.
more beautiful than some of our basic scientific
gineering relationships? Here is simplicity, sym
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creation of new and exciting combinations. What
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general principles that are timeless and univer
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jet. We share a problem with great artists in that the
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and mathematical works are not widely appreciated. No
one who has not mastered the basic disciplines of science
is qualified to judge the aesthetic value of our work. aes
The artist and the scientist or engineer have much in no
common. Both, very unlike Nature, Many of our leaders are
not bad amateur painters, musicians, and sculptors, even RE
without training. Although few have prospered, as did 1.
Leonardo da Vinci, as both artist and engineer, it is
clear that for many a fundamental choice of profession

Early in 1966 in New York City a meeting took place between a group of artists and engineers that was to lead to one of the most unusual experiments in cooperation between art and technology ever attempted. Most of the artists, dancers, and musicians were members of the Judson Church Group from Washington Square; the electronic engineers were from Bell Telephone Laboratories, Inc., of Murray Hill, New Jersey. They were brought together by Billy Kluver, physicist-engineer and electronics engineer at Bell. The project got off to an uneasy start. In Kluver's words: "Everyone seemed to be aware of everyone else. Nobody knew quite what to say until one of the engineers suggested to another: 'Let's tell them about something they can use.' The ice was broken."

Meeting followed meeting; ideas from both artists and engineers were suggested, discarded, replaced by new ones; until in May, work began on the equipment. On October 13 "9 Evenings: Theater & Engineering" opened at New York City's Sixty-fifth Street Armory.

The program for "9 Evenings" included ten "events" or theater pieces—each by a different artist and each with its own performance engineer—presented in different combinations through October 25. More than $30,000 was spent on technical equipment for the pieces which ranged from Robert Rauschenberg's "Open Score," a tennis game with rackets wired for transmission of sound, with the sound of the game, to Yvonne Rainer's "Carriage Discreteness," in which the dancers themselves, the artists and even the audience were the important visual concern. Even more than the individual pieces, it was the total environment that these artists created over a two-week period, and the interest and excitement that it aroused in the participants, that were significant.

As Kluver has pointed out: "A direct invitation by any industry to absolutely the extensive use of professional technology potentials of professional technology potentials in the true sense of the word. Its results are open for the future."

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Spectral lines

Engineering and art. It is high time that someone refuted the notion that art and engineering are antithetical. Too often I have heard it said that engineering is cold and unfeeling, or even depressing; that the engineer with his slide rule and transit, his concrete and steel, or his wires and electrons does not appreciate the "finer things"; that his works are without aesthetic value.

Could it be that the authors of such remarks lack a comprehension of some of the most beautiful and moving elements of human experience? Surely, they do not understand the forces that motivate most of us, or appreciate the pervasiveness of art. They do not like what they do not understand.

I have never found a widely accepted definition of art. If we believe that "art is creation for (aesthetic) satisfaction," or "the application of ingenuity to the manipulation of emotion," or "systematic application of knowledge or skill in affecting a desired result," or "application of skill or taste to production according to aesthetic principles" (Webster), we admit the greater part of creative experience and must include our own creations. Indeed, are we not surrounded with examples of engineering that stand out as some of man's most aesthetic creations—the Golden Gate Bridge, the Eiffel Tower, the F-11 jet, or the 1903 Oldsmobile? Some of the best examples of modern art are created in our own field. Have you ever looked closely at a thin-film integrated circuit or a thyratron in action?

But man's most beautiful creations are not physical. They are to be found in the conception of ideas. What is more beautiful than some of our basic scientific or engineering relationships? Here is simplicity, symmetry, variety, contrast, order, and an element of surprise. And what of the concepts of resonance, harmonic analysis, with overtones in quantum mechanics almost beyond human comprehension? As in other branches of art, pleasure is found in the synthesis of such ideas in the creation of new and exciting combinations. What can have more aesthetic value than the appreciation of general principles that are timeless and universal? The catenary is more beautiful than the bridge; the logarithm than the tower; Newton's third law than the jet. We share a problem with great artists in that the beauty and significance of great engineering, scientific, and mathematical works are not widely appreciated. No one who has not mastered the basic disciplines of science is qualified to judge the aesthetic value of our work.

The artist and the scientist or engineer have much in common in their very nature. Many of our leaders are not bad amateur painters, musicians, and sculptors, even without training. Although few have prospered, as did Leonardo da Vinci, as both artist and engineer, it is clear that for many a fundamental choice of profession was made very early in life and through rather subtle influences. In many cases, the basic difference is in concentration of effort. We agree with Spengler[1] that: "Newton, Gauss, and Riemann were artist-natures, and we know with what suddenness their great conception came upon them."

Under slightly different social conditions might not many of us have ended up in the arts, and conversely? Are not the great peaks of productivity in the arts and sciences perhaps caused by the attraction of the most gifted people to the areas in which such advances are made? In recent years there have been unprecedented forces encouraging gifted youth into the sciences. Probably many potentially great artists today are creating new physical theories, or building jet engines.

Great art is often not recognized as such by the generation that produces it. Perhaps we are living in the midst of what will eventually be seen as the best example of this, an artistic renaissance in the form of engineering.

It is difficult to find examples of modern art produced by premeditation that can excel the sometimes accidental output of our machines and laboratories. The best example of junk art I have seen was an experimental transistor amplifier with uncut pigtails and no breadboard, which an engineer had tacked to his door because it was "pretty." The computer has produced random patterns more Mondrian than Mondrian's own work.[2]

We can take some satisfaction in recent efforts to promote collaboration between artists and engineers, and between artists and digital computers. Artists have always worked with the tools of applied science, else they would be without paint, chisels, or strings. It is high time they learned to use electronics and power more effectively in their creations, whereas engineers undoubtedly can profit from the artistic viewpoint. Collaboration is common in the popular arts, in the mass market of publishing and entertainment, styling and architecture. Unfortunately, excellence in art has not often survived the relationship. Collaboration of engineers with the purveyors of "fine art" and modern art" will be really productive only if we match excellence with competence. The problem doubtless is one of communication between such diverse points of view. Let us hope that some can successfully bridge the gap. The artist who profits most therefrom will have become an engineer.

We build with solid stuff but our works are not less aesthetic because they are useful. Let us apologize to no one. Engineering is nobility in art.—*C. C. Cutler*

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2. Noll, A. M., "The digital computer as a creative medium," *IEEE Spectrum*, vol. 4, pp. 89–95, Oct. 1967.

pressbreaks

FROM EAT IN FUN CITY, N.Y., COMES a communiqué that just might pique the latent artistic appetities of all you bor but imaginative engineers. Not only that. The message explains a project which won't take you too far from your first love (engineering), and for your efforts you may earn substantial reward in money and human "interaction."

EAT is not looking for would-be gourmets. The acronym really stands for Experiments in Art and Technology, a nonprofit organization dedicated to the proposition that a work of art can result from the exploration of the human interaction between artist and engineer.

The organization is sponsoring a competition "for the best contribution by an engineer to a work of art produced in collaboration with an artist." There's a first prize of $3,000 and two $1,000 second-place awards.

Curious about the contest and EAT in general, we called New York to talk with EAT's Miss Sue Hartnett. "Frankly," we asked skeptically, "what happens when an engineer joins EAT? Does he just sit back and wait for his monthly newsletter to come in?"

"Nope," says Miss Hartnett. "Everyone who joins is a part of it. An artist may have a technical problem which falls in the realm of a particular guy. [She meant engineer.] He may call the engineer. From then on collaboration is up to them because it often gets to be strictly a human thing. Sometimes the artist just needs technical answers.

"Most often something really begins to happen. The technical guy begins to get ideas. He tells the artist who changes his ideas. By the time the final thing comes out, it's hard to say whose idea was what. But there it is in this one thing that happened.

"It has to do with engineers being more than 9 to 5 people."

Billy Klüver, a scientist at Bell Laboratories, Murray Hill, N.J., and a prime mover in the art-plus-engineering movement, adds even further understanding. He says that the artist gets a reaction from the engineer in any cooperative ventures like that being encouraged by the contest. "Really," he points out, "they – the artist and engineer – stimulate each other." Gimmicks aren't wanted, he emphasized, although that's what the engineer thinks of first.

"What's in it for the engineer?" we asked.

"Actually, EAT is more interested in bringing the engineers out – including the metals and materials men. The cooperative projects they would get involved in would center on achieving an art form. There would be no theoretical arguments, no question of values. You as an engineer would be faced with a completely different situation," says Dr. Klüver. It almost sounds like a challenge.

"What happens," he continues, "is that the engineer rapidly becomes sophisticated as he works on the project – sophisticated in the sense that he can make choices. He gets ideas on his own. And he's still functioning as an engineer. A feeling of being turned on replaces the skepticism and doubt."

So, if you want to be more than a 9 to 5 guy and if you want to get turned on to a new idea in art, you might just write a note to Miss Sue Hartnett, Experiments in Art and Technology Inc., 9 E. 16th St., New York 10003. She'll tell you all about EAT membership and the contest. Call area code 216-242-5014 if you want personal service.

THEATER & ENGINEERING

Early in 1966 in New York City a meeting took place between a group of artists and engineers that was to lead to one of the most unusual experiments in cooperation between art and technology ever attempted. Most of the artists, dancers, and musicians were members of the Judson Church Group from Washington Square; the electronic engineers were from Bell Telephone Laboratories, Inc., of Murray Hill, New Jersey. They were brought together by Billy Klüver, physical-optics and electronics engineer at Bell.

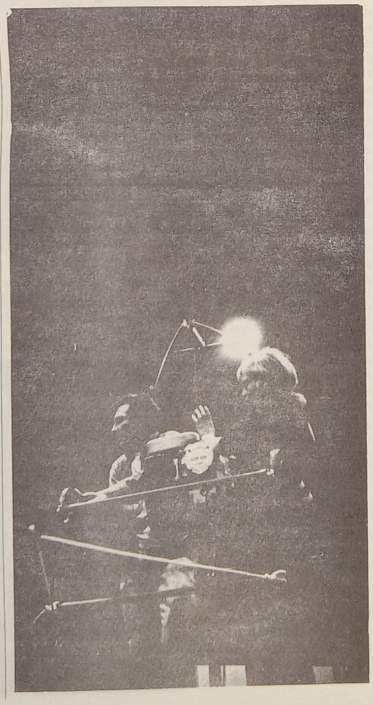
The project got off to an uneasy start. In Klüver's words, "Everyone seemed to be scared of everyone else. Nobody knew quite what to say until one of the engineers suggested to another: 'Let's tell them about something they can use.' The ice was broken."

Meeting followed meeting; ideas from both artists and engineers were suggested, discarded, replaced by new ones; until, in May, work began on the equipment. On October 13 "9 Evenings: Theater & Engineering" opened at New York City's Twenty-fifth Street Armory.

The program for 9 Evenings included ten "events," or theater pieces—each by a different artist and each with its own performance engineer—presented in differing combinations through October 25. More than $30,000 was spent on technical equipment for the pieces, which ranged from electronic musician John Cage's "Variations VII," in which the music came from reproducing the sounds in the air at the time of the performance and from a variety of household appliances and frequency generators; to Swedish painter and playwright Oyvind Fahlstrom's "Kisses Sweeter Than Wine," which utilized such phenomena as objects gradually changing color and pillows that sang out when bounced on the floor; to Pop artist Robert Rauschenberg's "Open Score," a tennis game with rackets wired for transmission of sound, with the sound of the game controlling the lights.

Predictably, public reaction to 9 Evenings was, to say the least, varied. But it is with the reactions of the artists and engineers themselves, for most of whom 9 Evenings marked an initial mutual contact, and with the important possibilities that stem from the experiment that these interviews, collected over a two-week period, are mainly concerned.

As Klüver has pointed out: "A direct involvement by industry is absolutely essential for any meaningful use of the potentials of professional technology by artists. . . . 9 Evenings is an experiment in the true sense of the word: its results are open for the future."



MARÍA CLARA MOYANO

October 13. The day of opening night. There was activity everywhere in the vast Armory. Musician John Cage was working with the tapes and machines set up on tables at the west end. Dancer Yvonne Ranier consulted with her engineer, Per Biorn, about the swing used by Steve Paxton in her piece, "Carriage Discreteness." Rehearsals were about to begin on Deborah Hay's "Solo." To the right, men were building the engineers' control room. Some children ran around the balloons for Oyvind Fahlstrom's piece, but the atmosphere was still one of unrelieved earnestness, unlike the unpressured gaiety that had preceded Washington's NOW Festival. [See AMERICAS, June 1966.] The final preparations seemed to be made at a dead beat.

PER BIORN

(From Copenhagen. Engineer in semiconductor research. Performance engineer for Yvonne Ranier's dance "Carriage Discreteness.")

"I've been at this since the first of May, and some have been working longer than that. I don't think a lot of us realized the work involved when we started. But it's a lot of fun. It's a challenge to work with artists, learning what they want, communicating. . . . Yes, I'm on my own time. I have a very strict bous. Right now I'm on vacation."

IRFAN CAMLIBEL

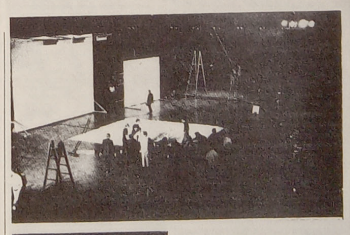
(Born in Istanbul. Works in absorption spectroscopy. Constructed most of the decoders for the theater electronic environment modular [TEEM] system, developed for 9 Evenings and the first of its kind for theater use.)

"I've been working strigly on my own time. They gave me three days' leave to help out. Although it has been a sacrifice in many ways, it was well worth it. The artists are going to learn a lot from this, and we are, too. I learned things here . . . things I hadn't been exposed to before. Like the artistic approach, and all about closed-circuit television. . . . Working with artists is quite an experience. You realize they're quite sensible, creative people. Quite a few of them know about science and technology. They're educated . . . at least this group working here."

RUDY KERL

(Technical assistant in gas laser research. Ham radio operator. Did most of the mechanical work on the TEEM system.)

"Doing all the electronic work was especially interesting. I never thought we could. . . . The artists really helped. They caught on very quickly. They always asked 'What can I do now?' if something was finished. . . . I'm sure the engineers and technical people in the audience realized the technical expertness involved in Alex Hay's piece. He was wired for





Above: Engineers, artists, and performers rehearse Swedish artist Oyvind Fahlstrom's piece, "Kisses Sweeter Than Wine".

Below: Fahlstrom (left) with 9 Evenings coordinator Billy Klüver (right)

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heartbeat and all kinds of sounds. I know some people in the audience walked out, but I think it was because they didn't realize what the sounds were. He was all wired up . . . that's what they do to the astronauts in advanced space research."

STEVE PAXTON

(Dancer and choreographer. Creator of "Physical Things," a dance with a set—a labyrinthine plastic tunnel, with flickering lights and taped projections—through which some members of the audience made their way as others looked on.)

"It's sort of inconceivable that this amount of work has gotten done, a fantastic amount of work. The logical expectation is that *nothing* would happen. Theater is a crisis situation. Everybody is racing the clock, saying 'We're not going to make it.' And then they do. Simply because one has to. . . . I think this is the best thing I've ever been involved in . . . the best working situation. Each audience has a personality. You can't predict it or manipulate it. If they like you, they respond. It's like standing in the wind. If it's too strong, it'll knock you over. . . . The audience seemed to enjoy the tube, like a Tunnel of Love. I think that having a good time is *very* important. I mean that, and I hate making pronouncements and statements."

October 15. In the Armory at noon.

The riggers were setting up the swing for Yvonne Ranier's piece. Billy Klüver was being interviewed by a newspaperman: "I can tell you that the expectation is enormous. It's almost a religious feeling. Technology finally *doing* something . . . not just bombs. . . ."

Irfan Camlibel talked about the performance of the night before: "I don't think the audience understood the complexity of the whole thing. But at least they stayed. We got them domesticated, you might say. . . . To us, it's a project; to the artists, it's a show. A project must never fail. Neither must a show, but I'm sure artists are more used to that. For the scientists the thing *cannot* fail."

John Cage and Klüver discussed forming an institute with the people from the Armory show, to work together and present occasional shows. Could it work?

JOHN CAGE

(Well-known composer and compositional innovator. Musical director of Merce Cunningham Dance Company. Author of musical piece "Variation VII," described by him as "indeterminate in form and detail." Cage combines unconventional sounds from electronic tapes and other mechanical sources to create his music.)

"I don't see why it shouldn't work. You saw the way they all sat around the table today, cutting wires for my piece. There was no problem of communication. Everybody was working happily together . . . dancers, artists, engineers, writers, housewives, Bob Rauschenberg's son . . . there was no uneasiness."

October 16.

L. J. "ROBBY" ROBINSON

(Works in mobile telephone research. Designed power amplifier for TEEM system. Performance engineer for Robert Whitman's "Two Holes of Water—3".)

"This group of artists was genuinely interested in searching out technology. When you work with an interested person, you become very interested in him. Our objective was never to tell the artists what to do, not to disturb the artist's mood or need, because that would be destructive. We worked with the artist as he put his piece together, and then saw what we could add to it. . . . Engineering requires cool, logical reactions. Art and engineering are two separate worlds. That's why it's so remarkable that this project works. The most important thing is the fact this is being done, regardless of what the audience thinks."

October 18. Afternoon.

ALEX HAY

(Choreographer and artist. His piece, "Grass Field," involved the transmission of internal body sounds through differential amplifiers.)

"The electronics involved in my piece are extremely difficult. It is never the same as I envisioned it, never as fanciful. The wires pick up electrical potentials from my organs and muscles and translate them into sound. . . . At first the engineers weren't as deeply involved as the artists, but once the full impact of the situation, and our seriousness, was understood, they became as committed to the concert as we were. . . . For them to be involved in such an ambitious undertaking is like being shoved onto another plateau. Now they've been in the most difficult technical and performing situation that has ever existed. . . . The end result should be, and logically would be, a commitment and involvement, an experimental industry. Industry would function with the artist, the artist with industry, using materials not generally available to him. An artist always functions better with materials that have more potential."

October 23. Noon.

ROBERT WHITMAN

(Creator of the "Two Holes of Water—3" piece, "a work around the stability of a film image and the immediacy of a newsflash." His theater work dates from the early days of the Happenings.)

"Technology is a world that's going to become more and more important to the artist, a world he's got to catch up with. . . . We pay no attention to bad reviews. Very few people are capable of writing a good review, either pro or con. I've had interviews with people who wanted to know what I was going to do so they could write about it beforehand. That's the kind of morality you have to deal with. Most reviewers are writing about things from what they learned years ago. They're not learning. . . . You're dealing here with very valuable professional people. They don't need you and can get along very well without you. This is the first time a body of professional men have been involved in a project of this kind. Now these very important scientists take us seriously, and from this I think that other members of other communities, other corporations, will take us seriously."

Evening.

LUCINDA CHILDS

(Majored in dance at Sarah Lawrence College. Formerly with Judson Dance Theater. Her piece, "Vehicle," utilized a glass booth that floated on an air cushion, designed by Per Biorn.)

"In dancing, you're not being someone else. Acting demands that. Dancing is a very ultimate kind of experience, using me ultimately. Just about everything I have is utilized. . . . The most dancers I have ever used in my work are seven. And I never tell them exactly what to do. They have instructions, but they carry them out in their own way. . . . This kind of mechanical equipment opens up many possibilities, ways of invention. The show has been a very good testing ground. Once you've made a step in that direction, you want to continue."

October 26. Oyvind Fahlstrom's loft on Front Street.

OYVIND FAHLSTROM

(Painter, poet, playwright, critic. Represented Sweden at 1966 Venice Biennale. Author of several Happenings in Stockholm. "Kisses Sweeter Than Wine," from 9 Evenings, was his first theater work presented in the United States.)

"The idea was to bring theater and dance up to the level of technology, and put technology in touch with poetic disorder and human insight, things that were *irrational* in terms of technique. The inventions to come out of the show can be developed as elements for works of art. The soap bubbles filled with helium that were in my piece will be used in theater, I'm sure. . . . I'm very interested in highly specialized, "computer" minds. In France they're called *idiots savantz*. They are retarded, yet able to perform incredible mathematical feats. They're overspecialized, like the computers. That's why I used a sequence from a science fiction movie in my piece. The last character in it discovers that he's actually a robot. . . . I think artists are either cool and purist, like Cage and Rauschenberg, or like Leary and Metzner, who have a fuzzy outlook, using art for their special aims. There is a third group, involved with activities in the world as it is today, Peter Weiss, for example. I feel in between all three, because I'm attracted to all three and have elements of all three in my work. One thing I have in common with the last group is the approach toward using material from the world-as-it-is: the tape I used with the drug addict, or the articles about the *idiot savant*."



Stage manager Judith Daly in front of control booth constructed for 9 Evenings

Evening. Kitchen of Bob Rauschenberg's home, Lafayette Street.

ROBERT RAUSCHENBERG

(Well-known painter and creator of Happenings. Creator of "Open Score," a tennis game with wired rackets. Winner of first prize for painting in the 1965 Venice Biennale.)

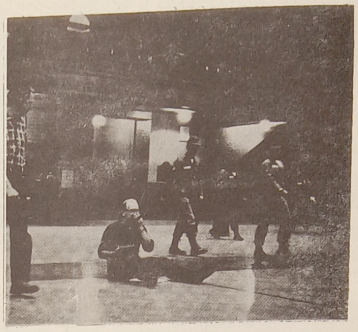
"I think the main accomplishment of the Armory show is the new foundation that has come out of it, for experiments in art and technology. It has been established to let other activities happen without all this groundwork, so that there will be support from industry and other foundations. It's also hoped that the inventions that come out of the collaboration between artists and engineers will be marketable, so there will be a steady income to support the foundation. The projects it sponsors will not be limited to the theater. . . . Sociologically and politically, the show was an extraordinary success; financially, definitely not. Society has the strangest idea that artists are outcasts and should be poverty stricken. It's almost revenge: the artist has to be an outcast or a luxury in society, because he's doing what he likes to do and other people have made decisions they're unhappy with. . . . Our thinking became different and very much influenced by the engineers' approach to the subject, but I think their sensibilities changed. That's the thing about this project: it opened up things instead of closing them down and refining them. Most art activity just builds up barricades that have to be overcome by the next group of artists."

October 29. Alex and Deborah Hay's loft, Howard Street.

DEBORAH HAY

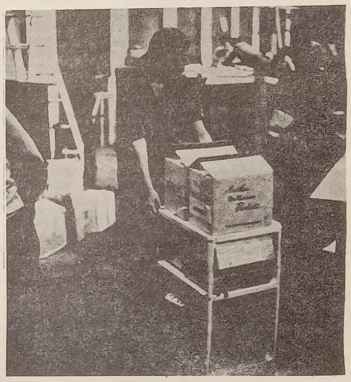
(Dancer, formerly with Merce Cunningham. Creator of "Solo," a piece whose principal visual elements were "moving performers, lights, darkness, remote control platforms, and movement—all elements equal in energy and visibility.")

"Engineers are much more stable than artists. And they were always *there*. They were very dependable in temperament. Maybe that's the difference: temperamentally, they were *there* all the time, whereas artists have more difficulty in being there. . . . I'm not a humanitarian. I'm not there to *bring* something to someone. I'm just there for it to make its way to them. I don't want to offer any solutions. I *could* work happily in my room, that could be my personality, but I'm bringing the work out. It's not a quirk. I'm not a painter. Painters do that. A dancer needs an audience. Theater happens in front of an audience. It's that confrontation that makes what we're doing *more* than what the established theater is doing. It's one of the most basic things that is changing. What we're doing is depending a lot on the confrontation. We're putting a lot in what we expect from the audience, and I think we're way ahead of the audience. I think people came out of their rooms before to *present* themselves in the theater, to show something done and mastered. We're coming out of our rooms to invite people in." □



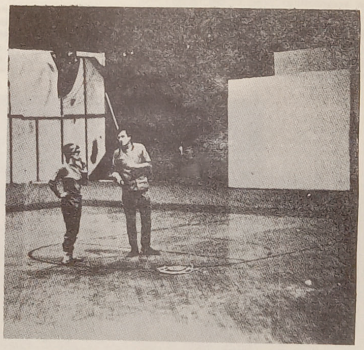
Right: Engineer L. J. "Robby" Robinson (seated on floor) and performers in a rehearsal of Oyvind Fahlstrom's piece

Below right: Dancer Lucinda Childs, creator of "Vehicle," works in control room



Inside the labyrinthine plastic tunnel used in choreographer Steve Paxton's "Physical Things"





Above: Dancer Deborah Hay and rigger Jon Hall during a 9 Evenings rehearsal

Below: Olga Klüver, Pep artist Robert Rauschenberg, and other performers in Deborah Hay's piece, "Solo"



ART & TECHNOLOGY— THE NEW COMBINE

Living as they do, in a supertechnolo society, American artists have quite naturally turned to the products, pr and imagery of science and industry. Some approach technology with trad attitudes, others are using it to alter the very definition of art, but all who to its fascination have responded wit a new sense of exhilaration and disco

Douglas M. Davis

Technology is stealing into art in so many ways, unseen, that its progress literally escapes us. We is there in art; we feel its presence every time w sculptural object that buzzes or dances or lights sense the influence of drugs in the rock music, the "be-ins" around us. Yet we lack a handle, a vocal ticate these phenomena. The new combine, art falling as it does between academic departmen "isms," particularly daunts us. Perhaps we can force of unparalleled strength, a force at once p joyous and mysterious.

We do not normally associate technology with almost never with mystery. We associate it wit rational, the inhuman. When, in 1951, Lewis Mum technology to the walls of a prison in "Art and spoke for a wide segment of sophisticated opinion. tion of *even so humble a chore as definition* ought t man and technology are one, not two.

"*Technology*"—on the dictionary level—is the ser ence," meaning an application of theory, as it is science, to practical problems, a distinction that sh throughout this article. On the simplest level, that app mean, for the artist, nothing more or less than a new p epoxy paint, or a new process, say the vacuum-formin Craig Kauffman to shape the plexiglas in his bold sculp jects. On a slightly higher level, "technology" can and mean, as Donald Schon points out in his brilliant book " nology and Change," "any tool or technique, any product process, any physical equipment or method of doing or making by which human capability is extended" [my italics]. Technology, in other words, is man's way of working, no less a part of him than his own brain or hands: Marshall McLuhan is therefor surely right when he calls technology an extension of the centr nervous system. There is more than making and extending in t new art, of course; there is "science" broadly considered, the k of science that is charting a new metaphysic as well as a computer-based society. We need to keep both the specific an general in mind, then, both the new tools provided by techn for the hand, and the new knowledge provided by science f mind.

The artist has always employed new tools and kn though never so readily as now, when he haunts the fa often as the museum. In the past the gap in time between product and its use in art was far wider. The Bauhaus, fluential school of design, was founded in Germany in 1 tially to close that gap—and from it came such archi Ludwig Mies van der Rohe, such painters as Josef Alb futurists and the constructivists, whose adherents number sians as well as Western Europeans, were also conscious mined to make art out of the materials around them. It is of their achievements that a contemporary artist like Larr can take the stand—in conversation and in his work—tha noble to make sculpture out of a light bulb as marble. angelo saw marble around him and worked with it," Riv "I use electricity. What's the difference?"

The differences is that of degree, and not only becau moved more slowly in the past; so did technology. Le Vinci actively sought new knowledge. He collaborate anatomist Marcantonio della Torre to learn what he complete his great figure studies and drawings. His pure technology was, of course, complete: he designed constructed everything from field guns to flying machi argument can be made, in fact, that the Renaissance f sance seemed to lack both the Greek penchant for ele thought (or art) above mere craft (or technology) a for glorifying specialized knowledge.

Whatever the shape of esthetic theory, technology left its imprint upon art. It has altered, quite radicall of pigment, that last reserve of the traditionalist. B and the maturation of chemistry as a science—few sy in use, most pigments being "natural," like carbon b

Douglas M. Davis, art critic of The National O written about new directions in literature, theat fine arts for several national magazines. He edited of Black Humor," published last fall by E. P. Dut

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ART IN AMERICA, JANUARY/FEBRUARY 1968 EXCERPT

ART & TECHNOLOGY— THE NEW COMBINE

Living as they do, in a supertechnological society, American artists have quite naturally turned to the products, processes and imagery of science and industry. Some approach technology with traditional attitudes, others are using it to alter the very definition of art, but all who succumb to its fascination have responded with a new sense of exhilaration and discovery

Douglas M. Davis

Technology is stealing into art in so many ways, some seen, others unseen, that its progress literally escapes us. We know technology is there in art; we feel its presence every time we stand before a sculptural object that buzzes or dances or lights up, much as we sense the influence of drugs in the rock music, the dancing and the "be-ins" around us. Yet we lack a handle, a vocabulary to domesticate these phenomena. The new combine, art and technology, falling as it does between academic departments and between "isms," particularly daunts us. Perhaps we can see it best as a force of unparalleled strength, a force at once profound, comic, joyous and mysterious.

We do not normally associate technology with comedy and joy, almost never with mystery. We associate it with the dry, the rational, the inhuman. When, in 1951, Lewis Mumford compared technology to the walls of a prison in "Art and Technics," he spoke for a wide segment of sophisticated opinion. But investigation of even so humble a chore as definition ought to reveal that man and technology are one, not two.

"Technology"—on the dictionary level—is the servant of "science," meaning an application of theory, as it is embodied in science, to practical problems, a distinction that shall be kept throughout this article. On the simplest level, that application can mean, for the artist, nothing more or less than a new product like epoxy paint, or a new process, say the vacuum-forming used by Craig Kauffman to shape the plexiglas in his bold sculptural objects. On a slightly higher level, "technology" can and should mean, as Donald Schon points out in his brilliant book "Technology and Change," "any tool or technique, any product or process, any physical equipment or method of doing or making, by which human capability is extended" [my italics]. Technology, in other words, is man's way of working, no less a part of him than his own brain or hands: Marshall McLuhan is therefore surely right when he calls technology an extension of the central nervous system. There is more than making and extending in this new art, of course: there is "science" broadly considered, the kind of science that is charting a new metaphysic as well as a new, computer-based society. We need to keep both the specific and the general in mind, then, both the new tools provided by technology for the hand, and the new knowledge provided by science for the mind.

The artist has always employed new tools and knowledge, though never so readily as now, when he haunts the factory as often as the museum. In the past the gap in time between the new product and its use in art was far wider. The Bauhaus, that influential school of design, was founded in Germany in 1919 partially to close that gap—and from it came such architects as Ludwig Mies van der Rohe, such painters as Josef Albers. The futurists and the constructivists, whose adherents numbered Russians as well as Western Europeans, were also consciously determined to make art out of the materials around them. It is because of their achievements that a contemporary artist like Larry Rivers can take the stand—in conversation and in his work—that it is as noble to make sculpture out of a light bulb as marble. "Michelangelo saw marble around him and worked with it," Rivers says. "I use electricity. What's the difference?"

The difference is that of degree, and not only because artists moved more slowly in the past: so did technology. Leonardo da Vinci actively sought new knowledge. He collaborated with the anatomist Marcantonio della Torre to learn what he needed to complete his great figure studies and drawings. His interest in pure technology was, of course, complete: he designed and in part constructed everything from field guns to flying machines. A good argument can be made, in fact, that the Renaissance far antedated the new tendency to mix art and science. The men of the Renaissance seemed to lack both the Greek penchant for elevating pure thought (or art) above mere craft (or technology) and our own for glorifying specialized knowledge.

Whatever the shape of esthetic theory, technology has always left its imprint upon art. It has altered, quite radically, the nature of pigment, that last reserve of the traditionalist. Before 1700—and the maturation of chemistry as a science—few synthetics were in use, most pigments being "natural," like carbon black, colored earth and certain natural metallic compounds. Since then, a number of colors—titanium white, Prussian blue, cobalt blue and a wide variety of yellows based on zinc, chromium and cadmium—have been added by chemistry to the painter's palette. The development of synthetic, quick-drying acrylic paints since World War II has literally transformed the application of color to canvas. They permit, to mention but one method, the wholesale "staining" of the canvas, characteristic of the work of the Washington color painters—Morris Louis, Kenneth Noland, Howard Mehring, among others. This staining sinks the color deep into the fibers, a process not possible with destructive oil-based pigments, which can only be applied over a primer. Acrylic paints are also among the most durable paints known. In 1959 the Artists Technical Research Institute was founded solely to collect and disseminate such information in an era of increasing chemical expertise.

Pop art and op art, as well as color painting, could not exist without modern technology—a truth so obvious it often escapes attention. The very meaning of pop art is based on *how* it is done—by methods normally associated with commercial art and the machine, not the brush, that instrument of the lone, gifted genius. As for op art, it is completely the child of optical science. Sculpture betrays an even closer relationship with technology; if we are indeed seeing the beginnings of a renaissance in sculpture, it is entirely due to technology. For centuries sculpture has been dominated by heavy materials like marble and bronze, both of which take considerable time to master and considerable expense to carve and cast. Today we live in a world of synthetic materials that are cheap, pliable and exciting: the sculptor can work directly with these materials in a way long denied him. "I can make anything now," says Chicago sculptor Mel Johnson. "I can make my pieces float, fly, suspend in the air or radiate odors." The presence of styrofoam, a soft, synthetic material developed by Dow Chemical, is proof in point. Styrofoam can be shaped or carved into the most complicated forms; then, as sculptor Calvin Albert recently discovered, a stream of molten metal magically turns the substance into metal. "The styrofoam melts, I think, upon contact with the heat of the molten metal," says Albert. "Foam casting" of this kind is widely employed and promises to increase as new foams are developed, along with the expertise needed to use them.

Young sculptors in California seem particularly open to the use of new materials and methods, surely because of the presence there of what are sometimes called "esoteric" industries, especially those involved with space technology. In 1965 Piotr Kowalski joined with North American Aviation to "form" a piece of sculptural metal by underwater explosion. Norman Zammitt's transparent plastic blocks, in which thin sheets of color seem to be suspended indefinitely, grew out of wartime needs plus the artist's own ingenuity: during World War II American industry developed a clear, durable acrylic plastic to protect the fighter pilot in his plane; years later, after much research, Zammitt invented a pigment that survives contact with the glue needed to fasten acrylic sheets together. In this case the time gap between product and art neared twenty years. De Wain Valentine's use of forms drawn from new technology (plastic objects made in the image of the rocket's nose cone) appears to have followed roughly the same time pattern, as does Larry Bell's "High Vacuum Optical Coating Machine." Originally commissioned by the U.S. Air Force, this machine lays an exquisitely thin coat of color onto glass, so thin and precise it can be measured in the millionths of an inch. Bell's glass "boxes," which both mirror and reflect the subtlest patterns of light and color, grew out of a direct, practical need for precision in optics.

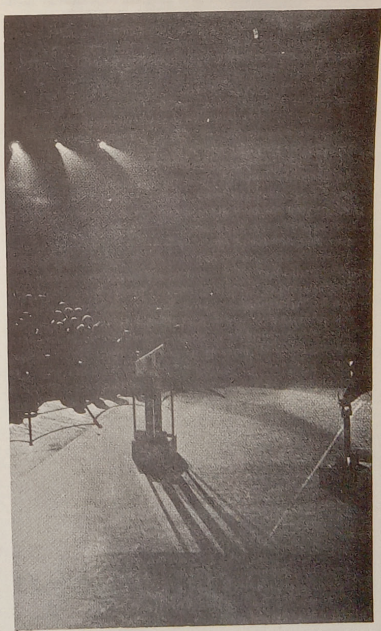
The connection between technology and kinetic sculpture is clear, too. Jean Tinguely, the most famous of the kinetic sculptors, is anti-machine in a wry, antic way, but certain of his colleagues evince an almost mystical positivism about the machine. The German Nicholas Schöffer has said that he wants to "humanize" the machine, that he sees in technology a chance to "liberate" mankind. The San Francisco sculptor Fletcher Benton puts it more succinctly: "I think kinetic art is involved in moving time in the same way that society is. It's more applicable to social change, say, than static culture." The sculpture of Charles Frazier, which dances, swims and flies, literally leaves the static world of the gallery behind. Late in 1966, James Seawright exhibited at New York's Stable Gallery eight "electronic sculptures," some fixed, some moving, all purely devoted to the forms of circuitry—amplifiers, oscillators, digital computers, wires—all making a kind of beauty entirely proper to more static materials. On every level, these sculptors display a fascination with parts, wheels, sounds and movements peculiar to our time.

The use of artificial light as a sculptural medium, pioneered in this country by Gyorgy Kepes of M.I.T. and now a full-blown art form, is yet another obvious instance of the meeting of technology and art. The same could be said of "factory sculpture"—the tendency, particularly strong among the minimal artists, Donald Judd, Robert Morris, Craig Kauffman, John McCracken and others, to have their pieces cut, shaped and sheened on order rather than in the studio. As for the computer, the most sophisticated of the new tools now at our disposal, it has just begun to be the subject of artistic exploration. At the Bell Telephone Laboratories in Murray Hill, New Jersey, it is being played like an instrument by such men as James Tenney, the composer, film-maker Stan Vanderbeek and engineer Michael Noll. Tenney, using the inherently mathematical nature of music and the computer's ability to create combinations of sounds, random or ordered, with tremendous speed, has produced compositions by and for the computer. Noll has translated probability theory into art by producing pictures on a graphic display unit attached to the computer. With this same unit he has created man/machine choreography and movies. Stan Vanderbeek's film "Studies in Computer-generated Graphics" moves letters and patterns derived from the machine backward and forward. It is surely no accident that Tenney's informal classes in computer methodology, begun last winter in New York, were attended by a wide range of artists, from playwrights and poets to dancers and composers. "I'm interested in the computer in the same way that a geologist would be interested in flying over an area in an airplane," says Tenney. "He can see from a great height formations that would otherwise take him years to study. With the computer I can experiment freely with large formal terms, like the symphony."

Avant-garde music was intimately involved with technology long before Tenney, of course. For years John Cage has been composing works with radios, amplifiers, oscillators, contact microphones, even the sounds picked up by antennae from outer space. In "Bandoneon!" David Tudor leaves his components (a combination of programmed audio circuits, moving loudspeakers, television images and lights) completely alone: the "instrument" composes its own music when activated, a principle employed, with qualifications, by many post-Cagean composers, among them Earle Brown, Morton Feldman, Henry Partch, Robert Ashley, David Behrman, Max Neuhaus, Alvin Lucier and Gordon Mumma. The dependence of electronic music, by now old stuff, on technology is clear: "Without the new tapes," composer Milton Babbitt has said, "electronic music could not exist."

Contemporary dance has its technological pioneers, too. Alwin Nikolais began to exploit light, as an independent medium and as an interacting agent with the dancer, at the Henry Street Playhouse in New York during the late 1950s. In Merce Cunningham's "Variations V" the dancers create their own sound accompaniment by moving near electronic poles that hum and buzz merrily in response. Choreographer-performers like Yvonne Rainer, Alex Hay, Robert Morris, Lucinda Childs and Robert Rauschenberg, many of whom began working at Judson Memorial Church in Greenwich Village during the early 1960s, go even farther. The involvement of the Judson Dancers in new technology was especially evident in "Nine Evenings: Theater and Engineering," presented in the fall of 1966 at the 69th Regiment Armory in New York. Certain of the "theater pieces" presented not only made use of esoteric (for the theater) technology—as in Yvonne Rainer's "Carriage Discreteness," where objects were programmed to move independently of the dancers—but some ceded to the machine itself creative functions—as in Lucinda Childs's "Vehicle," where sound waves from radio station WQXR turned lights on and off on the floor, emphasizing, for the audience, now this aspect of the performance, now another.

With "Nine Evenings"—and with the development of E.A.T. (Experiments in Art and Technology, Inc.), a foundation that grew out of the 1966 Armory performances—we sense a new combine of unparalleled radicality. In "The Two Cultures," published in 1960, C. P. Snow made much of the fact that "the literary culture" had little of practical use to give "the scientific culture," that, in effect, science was lord and master, art the follower. Now every new sign indicates the relationship is a good deal more complicated. As Donald Schon demonstrates, to begin with, the history of science is riddled with chance discoveries, discoveries that link science and art in a common irrationality. Calvin Albert's discovery of the uses of styrofoam is a perfect case in point of how an artist can come upon a physical truth by intuition and sheer need rather than by formal discipline, but his is not the only example. The artists and engineers who worked together for months preparing "Nine Evenings" found a phosphor that is



The composer David Tudor's "Nine Evenings" performance, which he called "Bandoneon! (a combine)," incorporated programmed audio circuits, moving loudspeakers, images and lights. The machines quite literally took over the stage and played themselves, so to speak, each "instrument" interacting with the other to produce a "composition." Photo by Peter Moore.

Douglas M. Davis, *art critic of The National Observer, has written about new directions in literature, theater and the fine arts for several national magazines. He edited "The World of Black Humor," published last fall by E. P. Dutton.*

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useful in infrared laser research. They invented a tiny power amplifier with clear commercial possibilities. They created a "proportional control system" which varied sound and light on stage simply by passing a small flashlight over a square glass covering sixteen photocells. They demanded and got (from Japan, finally) a special television camera, equipped with a tube receptive to infrared light, that literally "sees in the dark" and projects onto a screen clear images of activity performed in darkness. The camera is now being marketed in this country. When art and science interact, clearly, the new tools can be extended by both.

It is not only a matter of tools, but knowledge, too. We often hear from traditionalists, for example, that abstract painting is a flight from reality. But reality as it manifests itself to us now is hardly confined to the three-dimensional objects perceived by our naked eyes. We are told from birth that the building block of the universe is the atom; we now see nature's minute forms through the photomicroscope, the radiograph, and the spectrogram. At the other extreme, in scale, is the aerial photograph, so brilliantly exploited in recent years by Will Garnett and others—in response surely to the same concern for large forms that motivates James Tenney. And think again of McLuhan's claims for even so simple a technological gift as the television set. From earliest age the TV child watches images stream continuously before his eyes, images he neither fully understands nor relates one to another. Think now of the multi-screen films demonstrated at Expo 67 in Montreal, of a multi-media discothèque, of the Once Group's multi-media performances in Ann Arbor, Michigan, of Milton Cohen's "Space Theater," in which light and sound interact with each other simultaneously (and a dancing performer with both); or, more to the point, the happening. In a happening many events often occur at once, in no apparent logical order; its most enthusiastic support, moreover, has come from the first TV generation grown to early adulthood. Nam June Paik's decision to turn old TV sets—and the images on them—into sculptural objects thus makes exquisite historical sense.

Physics has further expanded our sensibilities. If the clock gave deism its perfect metaphor, substantiating a view of the universe ticking away in measured, mechanical time, twentieth-century physics has destroyed it. After Einstein, we have ceased in fact to believe in time. Both the new dance and the happening reflect this by ignoring measured time, the former by choreographing the body in a static state, the latter by stretching on interminably, sometimes for days.

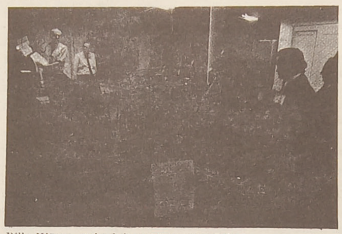
What past and present finally tell us about art and technology is that we are witnessing now not a completely new phenomenon in fact, but a radical mutation in an old relationship that has persisted through every kind of esthetic change. Four strains seem differentiated at this hour, the first three clearly traditional in every sense. There is the use by the artist of materials produced by recent technology. There is the use of tools and methods with the same derivation. There is the use of a new imagery suggested both by the tangible forms of technology and the revelations of science. And there is, finally, the full partnership between artist and machine in the creative process. Here alone do we near anything approaching radicality. Billy Klüver, the engineer who helped launch both "Nine Evenings" and E.A.T., once pointed out *that the goal of collaboration between artist and engineer is something that neither side could have imagined or created by itself. In the results of Klüver's collaborations—Jean Tinguely's self-destroying machine (Homage to New York)*, Robert Rauschenberg's five remote-controlled radios interacting as sound sculpture (*Oracle*), Andy Warhol's floating pillows, among many—this goal clearly has been realized. Per Biorn, another engineer, collaborated with the Argentine artist Marta Minujin to similar effect: the result, exhibited in New York last summer, was the "Minuphone," which produces a complicated set of light and sound responses in interaction with the spectator, who must step inside the work and speak into the phone. It is no wonder that Klüver has referred to himself as "a work of art," signaling the rise of technology to a new place of equality in art. In certain aspects of "Nine Evenings" the machine interacted fully, setting up independent patterns, together with the artist, a process inherent in nearly all the "playing" with and on the computer.

Thus the present scene is at once more conservative and more radical than it imagines itself to be. And dedicated more consciously than at any time in the past to the fusion of art with science, to reducing the lag—be it twenty, ten, or one year—between product and art. In E.A.T., in Gyorgy Kepes' Center for Advanced Visual Studies at M.I.T., in the Aesthetic Research Center of Venice, California, we see the rise of organizations actively dedicated to promoting that fusion, some supported by industries eager to capitalize on the commercial "fallout" sure to follow. Out of such organizations can only come in time new shapes and ideas unimaginable in the past, when art and technology related across a gap wide in time, a gap maintained by timidity and ignorance on both sides. The ignorance is vanishing now and the timidity receding, despite all the gloom engendered by prophets like Mumford, by facts like Hiroshima. We use technology now with an exuberance and a joy impossible even a decade ago—for reasons we shall shortly investigate, first through the medium of the users themselves.

J. Wilhelm (Billy) Klüver was born in Monaco in 1927. He graduated from the Royal Institute of Technology in Stockholm in 1951 and six years later took a Ph.D. in electrical engineering at the University of California in Berkeley. Since 1958 he has been on the Technical Staff at Bell Telephone Laboratories in Murray Hill, New Jersey, where he is currently working on the physics of infrared lasers. He has published seventeen technical papers and eleven on art; he also holds ten patents.

Klüver is a man of strength on the New York scene, though he works there with his left hand, so to speak, and without, as he himself insists, "artistic talent or formal training in art history." The shape of contemporary art might nonetheless be very different had Klüver not come to Murray Hill, near New York, in 1958. Since then he has not only contributed his engineering skills to specific works undertaken by Jean Tinguely, John Cage, Robert Rauschenberg, Jasper Johns and Andy Warhol, an involvement with artists extending back to his student days in Stockholm; he has also organized seven art exhibitions, coordinated the epic "Nine Evenings: Theater and Engineering" presented in New York in the fall of 1966, and virtually created E.A.T. (Experiments in Art and Technology, Inc.).

BILLY KLÜVER: THE ENGINEER AS A WORK OF ART



Billy Klüver, at far left, conducts one of the first meetings of E.A.T. (Experiments in Art and Technology, Inc.). Photo by Peter Moore.

Klüver's strength extends to his positions. They all push limits of various kinds—esthetic, social, philosophical—and have in common a deceptive simplicity. When pressed, as in the following questions, to explain the more controversial of his ideas—his declaration, for example, that it makes no difference whether technology really works in art—Klüver responds with such directness that he invites both confusion and disbelief. I recall a similar performance in Washington, D.C., at a luncheon attended by artists, politicians and cultural bureaucrats. Klüver advised the U.S. Information Agency to hire one man knowledgeable in the arts and put him in Washington, where he could then be phoned from abroad by anyone interested in learning about contemporary American art. The bureaucrats choked over the idea: it was too direct, too simple, too workable. The prospectus for E.A.T. evinces a similar practicality. Almost alone among the many new cultural organizations struggling for attention in this lush era of grantsmanship, E.A.T. plays up activity in its prospectus, plays down sociocultural rhetoric:

"The purpose of Experiments in Art and Technology, Inc. is to catalyze the inevitable active involvement of industry, technology and the arts. E.A.T. has assumed the responsibility of developing an effective collaborative relationship between artists and engineers.

"E.A.T. will guide the artist in achieving new art through new technology and work for the professional recognition of the engineer's technical contribution within the engineering community. . . .

"To ensure a continued fruitful interaction between a rapidly advancing technology and the arts, E.A.T. will work for a high standard of technical innovation in collaborative projects.

"E.A.T. is founded on the strong belief that an industrially sponsored, effective working relationship between artists and engineers will lead to new possibilities which will benefit society as a whole."

It should be kept in mind that many of Klüver's ideas bear the brands not only of Cage but of Duchamp and Rauschenberg. Part of the radicality of these ideas lies in their joyful tone. Unlike Kepes, Klüver appears to find satisfaction in art on the level of joy alone. He is in no way the brooding humanist, for all his apparent solemnity. Behind that, there is a side of him that needs to get out. In the conclusion to his delightful essay about his collaboration with Tinguely, "The Garden Party" (unpublished in America), he exposed this side most clearly:

"Jean kept saying that he was constantly thinking about New York as his machine took form. There are probably many connections, the most obvious being a machine that has rejected itself and become humor and poetry. New York has humor and poetry in spite of the presence of the machine, whereas in a purely technocratic society the machine must always be a functional object. Failures of the machine can therefore never be allowed because the control is the necessary element of the society. It is when the machine must function *a tout prix* that there can be no *Homage to New York*."

—D.M.D.

From the beginning of this century, certain artists have evinced a strong interest in technology, both its products and its processes. Do any of the earlier activities—on the part of the futurists, the members of the Bauhaus, even Duchamp—resemble those of the artists and engineers involved in "Nine Evenings" or in E.A.T.?

Marcel Duchamp initiated the artist's active commitment to the external world and made it the artist's responsibility to look without prejudice. This involvement in the physical world is the basis for the interest of contemporary artists in technology. Duchamp's commitment to reality is now becoming accepted. E.A.T. is a result. The Bauhaus and the futurists were, I think, involved with the process of seeing and with preserving certain idealistic notions about the world and not with what they could find out about the world. The function of technology as a material is not to put previous esthetic concepts into new forms but to provide the basis for a new esthetic, one that has an organic relationship with the contemporary world.

You seem to see the difference between the old fusion of art and technology and the new in terms of passive versus active. Is this why you once declared yourself a work of art?

I did so in an attempt to clarify the relation between the artist and the engineer. We cannot say that the engineer is creative in the artistic sense, nor that he is a performer, like the violinist. Until we understand this, many social and personal attitudes will come into play which have no significance for the ultimate collaboration, where, in fact, the contributions from the artist and the engineer are indistinguishable. Unlike the relation between the scientist and the engineer, the artist/engineer relationship is intimate and has no vertical components. The engineer's work does not follow the artist's as it does the scientist's.

Considerable time has passed since the presentation of "Nine Evenings" in the fall of 1966. What do you now consider its most important contribution?

Presentation of ten very good contemporary works for a large audience.

The press and audience got quite agitated over what they understood to be technological breakdowns during "Nine Evenings." Shouldn't we expect the technology involved in works of art, even "experimental" works of art, to work? To put it another way, isn't technological failure or success a valid criterion, if not the only one, for judging the work? At the very least, success will affect our reaction one way, failure another.

There are no "experimental" works of art. "Agitation" on the part of the press and the audience provides no reason for taking any action in relation to the work if the cause of the agitation lies in the structure of the work. A work of art is either good or bad, and it's up to you to decide what you want to call it. Only the bad critic is out to save the bad artist.

During "Nine Evenings" the audience was almost completely unaware of the technical elements; it found failures where there were none and technical successes where no technology was involved. The difference between the technical elements and the rest of the artist's material has not been grasped by the audience, except for very trivial use of blinking lights and reflections and the use of sound.

The idea that technical elements have to work puts a foreign constraint on the use of technology in art. When we worked on Jean Tinguely's *Homage to New York* in 1960, the decision was made to spend our time adding more to the machine rather than testing what we had built. We also decided not to interfere with the machine once it was put into operation. Some of the things that went "wrong" could very easily have been fixed during the twenty-seven minutes the machine lasted. People did not like this decision. As our understanding of technology increases, the question of success or failure will disappear. The focus of the interest will then be on the incredibly rich and varied possibilities of technology.

We have to live with a work of art or fight it. Technological success or failure cannot be criteria for judging the work. A work of art loses its interest if it is only judged according to predetermined norms. To assume such an attitude would be disrespectful toward the audience, and it would never allow the collaboration between artists and engineers to mature.

In other words, you want technology in its relationship with art to be adventurous rather than mechanical.

The relationship should be experimental and intuitive in the same sense that scientific research is—I am not using the word "experimental" as it is used in connection with art—and therefore full of risks. Whether the technology works or fails is not a very important aspect of this relationship. We know for sure we can always make something work.

I remember your saying you hoped E.A.T. would fade away someday. When? Why?

It is a pleasant thought to assume that institutions can fade away, particularly if they have to do with art. Another possibility is always to stay "ahead" of the artists.

Why are artists and engineers attracted to the idea of working together? Why did you begin doing so?

The artist cannot handle the complexities of technology all by himself—even if he has proper access. For the engineer, working with the artist means taking on new, complex and interesting problems which will help increase his professional standing. A different approach always stimulates new ideas. I began working with artists because they asked me to.

Are the engineers as eager to work with artists as the reverse?

It is not possible to say yet who is running after whom since the artists know more about the situation than the engineers. There are more engineers than there are artists, so the collaboration may well lead to an increase in the artistic population. But the technical-scientific community tends to isolate itself. In many respects, it will be up to the artists to convince the engineers to participate. I have yet to meet a scientist who would collaborate with an artist—or who could.

Why do you say that? How are scientists different from engineers? There are many people, you know, who are banking on the probability of an alliance between art and science.

The engineer and the artist deal with the physical world and work for direct solutions of problems. The scientist is not trained to deal with and handle the physical world. His goal is to understand it in terms of a specific language of little interest outside science. The scientist's dedication to his work has much the same quality as the artist's, but their areas of vision and realization are widely different. They simply cannot understand each other. A relationship between an artist and a scientist would be incestuous today. Let's hope that it is not so tomorrow!

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You've been "material" for many works and artists—among them Tinguely, Rauschenberg, Johns. Which collaboration on which work succeeded best and why? What, in other words, makes such a collaboration successful, from the engineer's point of view?

Together with another engineer, Harold Hodges, I have worked on projects for several artists. Harold made several original contributions to each. The Tinguely collaboration was, if you wish, the most innocent of them all.

The collaboration is a success when the artist and the engineer can see each other's work and get stimulated by each other's contributions, so that the work changes organically to something other than it was in the beginning. The greatest handicap is not knowing how to talk to each other. Professional recognition of the work within the engineering community represents the best "reward" for the engineer.

Jack Tworkov implied, in a panel discussion at the T.M.H.A. in New York, that you, John Cage and others deeply involved with the fusion of art and technology are trying to rush us along toward Utopia. Are you?

No. And I don't know what John's feelings are about Utopia. To me it has always sounded like a pretty dull place. I can make no claims about the importance of the art and technology collaboration. It will not give people food and housing, and it will not stop the war in Vietnam.

What motivates you, then, in your drive to establish E.A.T.? The motivation cannot be exclusively practical or esthetic. You must have some social end in mind, at least partly. Lewis Mumford and those who share his views want art to "humanize" technology in some way.

My motives are: One, Artists are incredibly neglected by society. In spite of all the foundations and publicity, most artists starve or waste their lives on silly projects. We give many billions to scientists; we should give at least a few to artists. Of course, no one would dare tell a scientist what to do. But we hamper the artist with our preconceived notions. "The artist should grind his own pigments," people say. Everyone knows what art is and hence who is the "real" artist. It is a disgusting situation.

Two, Pleasure. Technology is for pleasure, variety, change, respect for individual choice and human relationships. Art and technology go well together in a world run by people who consider boredom the greatest virtue.

Should we fear, embrace or ignore technology?

The enormous canyon that separates the art-intellectual world from technology is becoming deeper and wider every year. Technology and science succeed and form their own language of protection, which does not include the rest of the world in realistic, contemporary terms. The art-intellectual community is becoming increasingly frustrated at not being able to act in an equally successful area. The resulting love-hate relationship with science and technology (of which the technical community knows nothing —it is off playing Beethoven) is a waste of time. Technology helps nature (Aristotle) and is in fact indistinguishable from nature. Since the capacity of technology increases exponentially and the "progress" of the rest of the community appears more or less static, something is bound to happen. Somehow we will establish a personal, friendly contact.



INTEGRAR EL ARTE CON LA TECNOLOGIA

EXPERIENCIA NEOYORQUINA CON ECO EN BUENOS AIRES

"Para mí la máquina está por encima de todo instrumento que me permita ser poético".

Jean Tinguely

SE ESTA gestando en Buenos Aires la filial local del EAT (Experimentos en Arte y Tecnología). Al igual que Genova, Estocolmo, San Francisco, Nueva Haven o Mineápolis, Buenos Aires quiere ponerse en horario internacional, e intentar —por primera vez en la década del 60— expresarse con el lenguaje de la vanguardia.

El propósito del grupo es la integración del actual desarrollo industrial, tecnológico y artístico. El EAT ha asumido en Nueva York la responsabilidad de una colaboración efectiva, para permitir al artista superar sus medios tradicionales con la ayuda de la tecnología. Es evidente que los ingenieros de nuestra era cibernética tienen un papel fundamental en el cambio social que se está produciendo.

Los ingenieros y técnicos más sensibles de nuestro entorno industrial y urbano, han percibido ya cómo el "mundo de los artistas" puede influir en su trabajo y darle una dimensión humana. Los artistas a su vez, no pueden ignorar el folklore que los rodea, y toman conciencia de la naturaleza tecnológica e industrial de nuestro medio social, para crear un lenguaje nuevo basado en la inserción del hecho sociológico en la expresión individual. Las investigaciones se dan en dos planos al mismo tiempo. En un primer camino —el más tímido— las experiencias que se ubican aun, a nivel de la imagen bidimensional.

Es el esfuerzo de *reestructurar* en el soporte clásico de la tela o el papel la imagen del objeto con las técnicas nuevas: las seriegrafías de *Warhol*, las chapas esmaltadas de *Lichtenstein*, los fotogramas de *Bertini*, los acrílicos impresos e imantados de *Fählstrom*, las fantasmagorías de *Nikos*, etc.

En el otro lado, los que se sitúan a nivel del "objeto en sí". Los que toman una parte de lo real como si fuera el todo. El arte del "assemblage", los "ready-made" de *Marcel Duchamp*, los "combines" de *Rauschenberg*, las acumulaciones de *Arman*, los "fiberglass" de Morris, los "environements", las fantasías prospectivas (donde la escultura se confunde con la arquitectura) de Yona Friedman, Paul Maymont, Walter Jonas o Nicolás Schöffer.

Para materializar la accion —hasta ahora individual— de artistas, técnicos e ingenieros, aparece el EAT, capitalizando esta verdadera revolución sociológica, que es la colaboración estrecha de artistas y técnicos.

Alrededor de 300 artistas se han agrupado en Nueva York para requerir la ayuda de los 75 ingenieros que colaboran con el EAT. Sus proyectos son de tal coraje, que ya no pueden realizarse a través de simples centros de informaciôn, o con ayuda de la bibliografía adecuada Los artistas necesitan una colaboración no solo a nivel de conocimiento, sino total.

Los técnicos a su vez, podrán salir así del rígido mundo de su tra-



OBJETOS CON SONIDO
En la "Dwan Gallery" de N. York

JOHN PIERCE
Integrar la cultura y la vida

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"COSAS FISICAS"
De Steve Paxton y el Ing. D. Wolf



MARCEL DUCHAMP
"Objeto para ser destruido"

bajo, antítesis de su vida cotidiana.

Estas nuevas estructuras experimentales que quiere materializar el EAT no pretenden anular de manera alguna las anteriores.

Solamente quieren —originando nuevos sistemas de integración de sensaciones— reemplazar los cánones clásicos de la realización artística: un descubrimiento tecnológico origina una interpretación plástica; ésta a su vez sugiere la utilización práctica de un nuevo material que ya existe, pero que todavía no se ha desarrollado al alcance de la vida cotidiana.

Así como la aparición de la máquina y de la tecnología han tenido una notable repercusión en el terreno del hecho artístico, es indudable que tal conmoción se ha dado también a nivel de la inteligencia y la sensibilidad.

En su libro "Forma" el pintor, escultor, arquitecto y maestro *Max* Bill (donde hace un balance sobre la evolución de la *forma* a mediados del siglo actual) investiga teóricamente la perfección de la forma alcanzada en una gran cantidad de los productos de la industria.

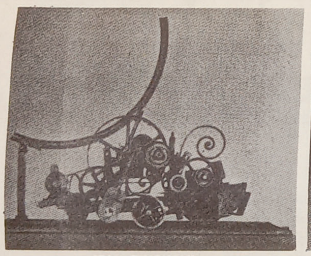
Esa perfección —condición tanto de las formas artísticas como de las formas técnicas— hace escribir a Max Bill "... hasta qué punto es estrecha la espontánea relación que existe entre las obras de arte y los productos industriales, es cosa que se manifiesta en la comparación de las esculturas y los automóviles de una misma época".

Dejando de lado las interpretaciones estéticas que hacen del arte un poder desligado de toda servidumbre (los artistas de la *torre de marfil*, que en posesión de un particular estado de gracia, entran en contacto con lo absoluto más allá del espacio y de la historia) el estilo del arte actual tiende hacia la efectiva colaboración de artistas y técnicos.

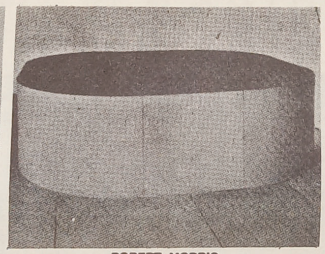
No como trasferencias de formas realizadas por técnicos, sino en la creación conjunta de nuevos lenguajes, de nuevas formas de expresión. Las actividades del grupo estadounidense son intensas.

El Comité de Proyectos, manejado por *Robby Robinson* (veterano organizador de las "9 Armoured Nights" y otros "environements") ofrece su colaboración abierta y desinteresada a cuanto artista o técnico quiera acercársele.

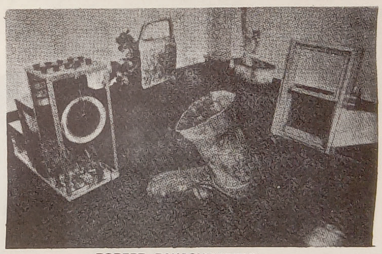
El suceso presentado ante un público de más de 1500 personas por noche fue llamado "9 tardes de teatro e ingeniería", y tuvo lugar en octubre del año pasado en la Tercera Avenida.



JEAN TINQUELY
Escultura de hierro



ROBERT MORRIS
Sin título. En fiberglass



ROBERT RAUSCHENBERG
"Oráculo"

Rememora el "Armony Show" de 1913, que marca la ruptura con las disciplinas y tradiciones pictóricas estadounidenses.

Un público seleccionado (y denominado "audiencia de avant-garde" por el crítico estadounidense Harold Rosenberg) participó así de este *poshappening* en el cual trabajó lo mejor de la vanguardia neoyorquina: John Gage, Robert Rauschenberg, Robert Whitman (de quien vimos en Buenos Aires "Ciruela chata"), Alex Hay, Oyvind Fähls-trom, Ivonne Rainer (mujer de Robert Morris, que exhibió su obra en Buenos Aires en el premio Di Tella).

El mismo ingeniero Robby Robinson ha organizado luego un "Programa de Voces Contemporáneas" en el Instituto Politécnico de Rensselaer, y la conocida *Carolee Schneeman*, realizó en el "Teatro Martinique" un espectáculo audiovisual llamado "Snows", con sonidos y luces moduladas, ayudada por los ingenieros del EAT, *Ralph Flynn* y *Per Biorn*, que utilizaron un órgano de colores, realizado por *Lawrence Warshow*.

En la Galería Park Place, los ingenieros *Ralp Flynn* y *Ted Wolff* han presentado el concierto de Max Neuhaus, utilizando células foto-eléctricas para originar y desarrollar un juego de variaciones luminosas.

El mismo Ralph Flynn, con la colaboración del ingeniero *Harold Hodges* ofreció una representación en el salón de actos de la Universidad de Nueva York, con tubos blandos de neón, ejecutados por *Robert Rauschenberg*.

Cuando en el estudio de Rauschenberg, el EAT presentó su programa a la comunidad, en un acto en el que hablaron artistas, universitarios, legisladores y dirigentes industriales, dijo el Dr. *John Pierce* director ejecutivo de Bell Telephone Laboratories:

"La tecnología es una de las fuentes de nuestra era actual. El hombre no puede vivir sin arte. Pero a veces, pareciera que nuestra cultura, y nuestra vida cotidiana estuvieran fragmentadas. Por ello me alegra que este talentoso grupo del EAT, quiera integrar —a través de sus experiencias— el arte y la tecnología"

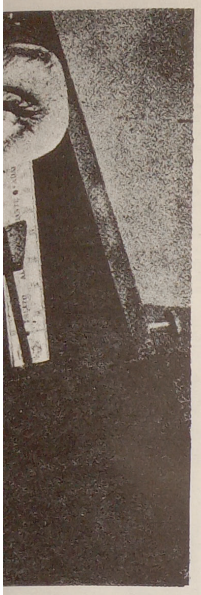
Billy Klüver (presidente del EAT y también ingeniero de los laboratorios Bell), Robert Rauschenberg (el pintor estadounidense triunfador de Venecia) y sus colegas, abren un camino al utilizar la tecnología para fines creativos y sociales.

En este momento el EAT está preparando su colaboración con el Museo de Arte Moderno de Nueva York, que presentará a fines de año, una muestra titulada "La máquina". Dirigida por K. Hulten, director del Moderna Musset, de Estocolmo, incluirá el desarrollo histórico y actual de las obras de arte relacionadas con las máquinas y el mundo de las máquinas, una fértil fuente de inspiración desde hace medio siglo.

Los *futuristas* la utilizaron para expresar su romántico entusiasmo por la velocidad; los *dadaístas* en una enorme variedad de invenciones sardónicas y fantásticas, dieron su versión "infernal" de la máquina; *Calder* y *Le Parc* repusieron el optimismo, y el placer de las formas en movimiento; el grupo del EAT —reaccionando contra la posición altamente individualista de la posguerra, y su espíritu de ansiedad— quiere originar una nueva concepción del arte basada en el trabajo colectivo de artistas y técnicos. ◆

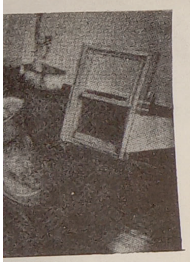
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JOURNAL OF THE SMPTE, FEBRUARY 1968

Experiments in Art and Technology, Inc., was organized in the fall of 1966 to "maintain a constructive climate for the recognition of the new technology and the arts by a civilized collaboration between groups unrealistically developing in isolation; eliminate the separation of the individual from technological change . . . and encourage industrial initiative." During the brief time E.A.T. has been in existence it has acquired an impressive list of sponsors, including the AFL/CIO.

The E.A.T. approach to the union of art and technology is not exactly new, since the artist, and particularly the artist whose work is involved with relationships of form, space, time and light, has always been dependent upon the technician. However, this may be the first time that the artist and the engineer will be working together on an equal footing to produce a work of art that will express both the artist's and the engineer's view of life.

The E.A.T. philosophy should be of particular interest to motion-picture and television technicians, since the true collaboration of the engineer and the artist began with the advent of motion picture as an art form and became even more a matter of necessity with the development of television. This symbiotic relationship is especially significant in this context.

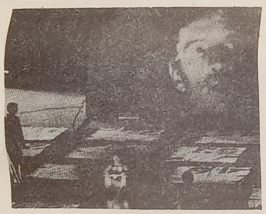
Chairman of the Board of Directors of E.A.T. is John G. Powers. Theodore W. Kheel is Chairman of the Executive Committee. The President is J. Wilhelm Kluver, an electronics engineer at Bell Telephone Laboratories who specializes in laser research. Other officers are Robert Rauschenberg, Vice-President; Fred D. Waldhauer, Secretary, and Robert Whitman, Treasurer. Headquarters of E.A.T. are presently at Mr. Rauschenberg's home at 9 East 16 St., New York, N.Y. 10003, but arrangements are now underway for establishing its headquarters at Automation House, 49 E. 68 St., a building owned by the American Foundation on Automation and Employment.

The E.A.T. debut (for the general public) took place October 10 in a loft with examples of the avant-grade resulting from the "working alliance" of art and technology. One of the most attention-getting results of the union of art and technology was a computer-generated nude created by two engineers. The steps in its creation began with a photograph from which a transparency was made. The transparency was then scanned with a device operating like a television camera. The information on the transparency was then stored on magnetic tape in the form of pulses standing for digits with the brightness elements represented by numbers ranging from 0 to 7. After processing all the numbers the computer printed a drawing of micropatterns formed by clusters of signals used in the electronic design.

While the showing was arranged after E.A.T. became a corporate entity, it really began with an earlier event — the *9 Evenings: Theater and Engineering* which was shown last year at the 69th Regiment Armory in New York to an audience of more than 10,000; *9 Evenings* resulted from the collaboration of 40 engineers and 10 artists.

A future event of considerable importance will be a Museum of Modern Art exhibit to be called *The Machine*. It will be held in the fall of 1968. E.A.T. has announced a competition for works of art produced by an artist-engineer team, with a jury of scientists and engineers selecting those to be shown at the Museum of Modern Art. Monetary prizes are also offered (*Journal*, p. 56, January 1968). The exhibit will be directed by K. G. P. Hulten, Director of Moderna Museet, Stockholm.

MACHINE DESIGN, FEBRUARY 29, 1968



Amplified internal body sounds and a projected TV image of dancer Alex Hay (left) were technological contributions to an avant-garde performance entitled "Grass Field."

Merging Engineering And Art

Two years ago, engineers at Bell Telephone Laboratories entered into a collaboration with *avant garde* artists to produce what was probably one of the weirdest theater performances in stage history, "Nine Evenings: Theater and Engineering." As a measure of the technical input, the engineers contributed an estimated $150,000 worth of their time. The way-out performances of dance, music and drama stand today as a pioneering example of the new art/technology alliance.

From this involvement of engineers and scientists with dancers, painters, playwrights, composers, musicians, and sculptors, a new institution appeared on the American cultural scene, Experiments in Art and Technology Inc. (EAT). Founded by Bell Labs engineer Billy Kluver and artist Robert Rauchenberg, EAT's overall objective is to link technology with the arts.

Start-up funding for EAT has come from companies like IBM, Atlantic-Richfield, and AT&T. Art councils, labor groups, and foundations have also provided seed money. Understandably, the artists have responded. But what is most needed is participation by engineers, and a campaign has been launched to recruit them (EAT's address is 9 East 16th St., New York 10003).

EAT arranges for engineers and artists to come together for the purpose of creating new works of art. When an artist requests technical help, EAT finds an engineer with appropriate interests. The two then collaborate in a joint effort.

EAT already seems to have a viable program. In conjunction with the Museum of Modern Art, it is sponsoring a nationwide art contest for the "most inventive use of new technology." Prizes will be awarded, and winning works will be exhibited in the Museum.

THE GLOBE AND MAIL, MARCH 7, 1968

EAT gives audience electrifying experience

By WENDY MICHENER

The Toronto local of EAT (Experiments in Art and Technology) was born yesterday over lunch, and had three dozen potential members by the end of last night's illustrated lecture by Billy Kluver, the second event of Ryerson's Sightsoundsystems.

Kluver is the electrical engineer who organized the famous nine evenings of Theatre and Engineering—an avant-garde art show—in the New York Regiment Armory two years ago. Since then he's followed through his aim of merging arts and technology to create EAT, an organization that has over 4,000 member artists and engineers.

The leader of Toronto's new-born group is Dennis Young, a curator at the Art Gallery of Ontario.

As illustrated lectures go, the evening was electrifying. When the audience pressed in to Ryerson's studio A, it was immediately surrounded with sights and sounds—if not system. Across one wall was a tryptych of stills and films from those first nine evenings. Some sentences from what might have been a lecture occasionally broke through a wall of sound recorded by John Cage by mixing sounds from 18 open phone lines to restaurants, washrooms and street corners.

And all the while three harassed TV cameramen shot desperately around the studio through the maze of cables and plugs.

On the TV monitor was an intriguing mixture of third-generation reality: the TV camera's reproduction of slides as projected in the studio of creations that had often involved projections and strobe lights to begin with. In the studio we were surrounded by all these machines, the EM1 cameras on their Houston Fearless dollies, and the overhead projectors, and a Nagra for good old-fashioned radio, the unmixed medium. But there, on the monitor, it was all chopped into little fragments of unconnected, totally unorthodox pictures. And the strangest part is that often the TV picture looked far more real than anything I could see.

So by the time Kluver stood up and turned it all off, the point had been amply demonstrated: engineering and art have a lot to do with each other. Just to keep it experimental, the tall Swede with an ascetic face like a monk out of a flick by Ingmar Bergman, kept pacing around the floor.

"So what do you want me to do?" the frustrated cameraman yelled into his headset. But Kluver kept moving, and turning on and off lights, with the result that he looked about six times as interesting as your regular TV interviewee, well-lit and glue to his carefully placed chair.

"This environment is getting to be more and more like a natural environment," he said, looking very at home in it. "The richness of technology is infinite. Those TV cameras can do far more than they teach you here."

Kluver spoke convincingly of the projects that are leading such New York artists as Rauschenberg into areas they could not hope to explore without the help of engineers.

Some of the projects to date:

½ To make one or more floating forms following a man that moves;

½ to display on large screen the image under microscope;

½ to display on large screen the image under microscope;

½ Rauschenberg wants to float suspended in air.

It wasn't clear just how all these effects were going to fit into works of art, but the prospects turned some of the audience on.

"I'm getting tired of painting," said a girl in bangs as she signed her name in the little red membership book. *"I'd like to fill the Deer Park reservoir with jello—not too cold —not too hot.*

NEW YORK TIMES, MARCH 31, 1968 EXCERPT

Art Notes

EAT HEARTY

Meanwhile, a progress report on EAT (formally known as Experiments in Art and Technology), a more constructive manifestation that sprang from the performance series, "Nine Evenings: Theater and Engineering," held at Manhattan's 69th Regiment Armory in the fall of '66.

First off, the organization of artists and engineers, whose purpose is to further rapport between art and technology, has acquired a full-time president. He is Francis Mason, former cultural affairs officer for the U. S. Information Service, who's most recently been in charge of U. S. exhibitions behind the Iron Curtain. But physicist Billy Kluver and artist Robert Rauschenberg, EAT's prime movers, will stay on at the policy helm—as chairman of the board of directors and vice chairman.

Secondly, EAT is spreading itself, both at home and abroad. It currently has "local and correspondent" groups in 35 cities in the U.S., Canada and overseas (the latest local opened two weeks ago in Boston). "Most of the applications for EAT membership—maybe 1,500 to 2,000—have come from out of town," says Kluver. "More artists than engineers, of course—most of the engineers don't dig modern art. They have to be brought around. Anyway, we decided we couldn't confine EAT to Manhattan. But we want the local groups to be autonomous. We'll help set them up, then cut the umbilical cord."

EAT will draw its chapters together this June in Manhattan for its first international conference. That will be augmented by a festival, organized by EAT and a group called Intermedia, Vancouver, and entitled "Live Sounds From Anywhere: An Experiment in Communication." The show will boast works resulting from collaborations between artists and the technical industrial world —dance, music, poetry, sculpture, environments.

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CHRISTIAN SCIENCE MONITOR, MAY 13, 1968 EXCERPT

'We're not interested in art,' the man said

By Roderick Nordell

Cambridge, Mass.

"We're not interested in art," said one of the founders of Experiments in Art and Technology.

Then why does "art" appear in the title of this rapidly expanding organization?

"That's a lawyer's idea," said Billy Klüver with a smile and a touch of the Swedish accent he brought with him to the United States in the middle '50's. He was referring to legal aspects of the incorporation of EAT, which was started in New York in 1966 and formally launched last fall.

Now, he said, some 40 branches have begun across the country and abroad. The first international EAT conference will be held in New York June 22 and 23.

Meanwhile, EAT has been asked to collaborate with the Museum of Modern Art in preparing a section "dedicated to new technology in art" in connection with a major MOMA exhibition, "The Machine," scheduled for the fall. At the same time EAT is offering a $3,000 first prize and two $1,000 second-place awards for "the best contribution by an engineer to a work of art produced in collaboration with an artist."

Yet, on a recent visit to Cambridge, Mr. Klüver, a laser specialist at Bell Laboratories, insisted that EAT was concerned not with the "end product" but with the "process."

Cage as an influence

Did this mean something like jazz, in which the art exists in the very process of its formation?

"Music is a process," Mr. Klüver said. He referred to the perennially avant-garde composer John Cage as an influence on the attitude of EAT. Cage is said sometimes to set down the score of a piece not in advance but after the process of a performance has been completed.

EAT seeks to bring artists, engineers, and equipment together to facilitate the process of their collaboration. At meetings of the recently formed New England group, for example, members are informally beginning EAT's "matching" approach, through which individual artists and engineers get together and mutual projects develop.

"The artist functions autonomously," explained Mr. Klüver at last October's announcement ceremonies in the studios of Robert Rauschenberg, who had joined Mr. Klüver in founding EAT with the help of Theodore W. Kheel, lawyer and labor mediator. "His constraints are physical. His subject matter is the relation of the human being to the world.

"The engineer works within a group. His work is bounded by economic consideration, existing investments in equipment, and regulatory standards.

"The raison d'être of EAT is that the collaboration may yield a work which is neither the preconception of the engineer nor the artist but a result of the human interaction between their two areas."

Environment of tomorrow

Mr. Klüver put the challenge this way: "We can no longer claim innocence for the human and social consequences resulting from technological change. We are, in all respects, responsible for the technology that will form our environment tomorrow."

This spring the New York headquarters of EAT, 9 East 16th Street, sponsored a series of lecture-demonstrations on such subjects as computer music, computer-generated still images, honeycomb structural papers, physiology of sound, acrylic materials, and casting, molding, and controls.

The international conference in June is open to "anyone interested in the organization and activities of EAT groups and in discussing the problems of carrying out EAT programs in their area." A second similar conference is planned for February in Canada with the collaboration of Intermedia, Vancouver.

SEATTLE TIMES, MAY 26, 1968

The Visual Arts

Art Plus Engineering Yields Vital Results

By JEAN BATIE
The Times' Art Reviewer

A drafty loft down in New York's garment district serves as headquarters for one of the most vital and interesting liaisons in the field of modern art: Art and technology.

With initials similar to one of Robert Indiana's roadside landscapes, Experiments in Art and Technology materialized after a series of unusual performances, "Nine Evenings: Theatre and Engineering," held in New York in the fall of '66.

Headed, among others, by Robert Rauschenberg, John Cage, and Alex Hay, these commandoes of the avant garde demonstrated that science and art could work together to mutual advantage.

E. A. T. SERVES as a clearing house for artists and scientists who would like to work together.

"The raison d'etre of E. A. T. is that the collaboration may yield a work which is neither the preconception of the engineer nor the artist but a result of the human interaction between their two areas," remarked Dr. Billy Kluver, an electronics engineer and laser specialist who is now Chairman of the Board.

On the two-way street, the artist learns enough about modern technology to develop new art forms while the engineer develops fresh insights which in all probability will lead to a more "people-oriented" technology.

Dr. Kluver has speculated that the participation of scientists and engineers in a program of this sort may help to arrest

to be held in the fall of 1968. E. A. T. will grant a first place award of $3,000 and two second place awards of $1,000 each to engineers who show the most creative use of technology.

THE DRAMATIC impact which technology has made on the arts was evident in several exhibitions and performances which I saw while I was in New York.

Tony Martin, who designed the psychedelic lighting effects for the Electric Circus, had a multi-media (also called intermedia) exhibit at the Howard Wise Gallery.

Here the viewer, stepping on photoelectric cells, could control his own environment by choosing one of four tinted spotlights with color-related images and sounds.

After this, the same gallery had a remarkable exhibit of cybernetic sculpture by Tsai, an American artist with an engineering degree who was born in China in 1928. Using stainless steel rods and polished metallic plates, Tsai devised sunbursts and reed-like clusters which oscillated rapidly according to an electronically activated environment. Visual effects were modulated by high-frequency lighting.

At the Bonino Gallery, Korean born Nam June Paik changed the images on color TV sets into swirling Op art by using such devices as electro-magnets and signal interceptors.

At the Brooklyn Academy of Music, Merce Cunningham presented "Rainforest," a new ballet for which Andy Warhol designed a set consisting of eerie helium filled

One of the major problems confronting E. A. T. is the dearth of technical members. "We have thousands of artists," Erlichman said, "but not enough engineers."

Financial support for E. A. T. has come from both industry and labor. A. T. and T., I. B. M., Xerox, Kaiser Aluminum, Atlantic-Richfield, the A. F. L.-C. I. O., the Transport Workers Union, and the Machinists and Aero-Space Workers Union are among its patrons.

"IT IS OUR idea that industry should sponsor this collaboration between artist and scientist," remarked Jean-Jacques Erlichman, who is head of E. A. T.'s public and industrial relations.

"Industry should sponsor it on company time and on company equipment in much the same way as it supports basic research.

"The engineer is a systems oriented person. By comparison, the artist is a purely autonomous figure. What we are doing is putting two polar qualities together."

Once an artist and an engineer develop a project, an engineering steering committee decides if technically the idea is feasible. If it is, the committee makes a recommendation to the company or organization sponsoring the project.

The Museum of Modern Art in New York has asked E. A. T. to collaborate on a technology in art exhibition

Seattle is one of the few areas where E. A. T.'s current ratio of two artists to one engineer could be reversed. I expect that there will be some interesting developments.

THE BROADWAY and off - Broadway musicals "Hair" and "Your Own Thing" both make extensive use of numerous sound and visual effects which technology has made possible.

"Avant garde artists," Erlichman said, "feel that in order to be artists in 1968, they have to be able to reflect the 1968 world through its most characteristic elements, and technology is one of the most important."

Membership in E. A. T. is open not only to scientists, engineers and artists but to dancers, poets, playwrights and musicians who look to new technology for new forms and ideas.

There are now twenty-three E. A. T. chapters in the United States and eight in foreign countries.

THE SEATTLE chapter, headed by William A. Fetter of Bellevue, will hold its first meeting in the very near future.

ARCHITECTURE CANADA, JUNE 1968

E.A.T.... Food for Thought

Arts

3

New Initiatives and the Architect

E.A.T., a New Organization, Forms a Subsidiary in Canada.

Experiments in Art and Technology: a Brief History

The decision to form Experiments in Art and Technology Inc. (E.A.T.) developed from the experience of producing the performance series, "Nine Evenings: Theater and Engineering" held at the 69th Regiment Armoury in New York, October 1966. Forty engineers and ten well known, avant-garde artists worked together to develop technical equipment which was used as an integral part of the theater, dance and music works. During the preparations for "Nine Evenings" it became clear that if a continuing and organic artist-engineer relationship was to be achieved, a major organized effort had to be made to set up the necessary physical and social conditions.

In November, 1966, a meeting was held for artists in New York City to find out if E.A.T. as an organization could work to provide the artists with access to the technical world. Over 300 artists, engineers, and other interested people attended and the reaction was positive. Billy Kluver, a physicist in laser research at the Bell Telephone Laboratories, became president and artist Robert Rauschenberg, vice-president. Membership was opened to all artists and engineers.

To involve the artist with the relevant forces shaping the technological world, the artist must have access to the people who are creating technology. Thus it was decided that E.A.T. act as a matching agency, through which an artist with a technical problem or a technologically complicated and advanced project be put in touch with an engineer or scientist who could collaborate with him. E.A.T. not only matches artists and engineers to work on collaborative projects but also works to secure industrial sponsorship for the projects that result from the collaboration.

E.A.T. aims to involve industry and also to gain the interest and support of other institutions in society: universities, foundations, labor, even politics. These broad contacts will cut across traditional boundaries and facilitate the completion of projects initiated by the artist-engineer collaboration. E.A.T. is founded on the strong belief that an industrially sponsored, effective working relationship between artists and engineers will lead to new possibilities which will benefit society as a whole.

It is not surprising that in view of activity in Canada of art and industry (see series in Arts section, *Architecture Canada*, February and March) that interest in this organization resulted in a subsidiary group being founded under the sympathetic encouragement of the Ontario Art Gallery in April.

Amongst the forty people invited to attend were: Anne Brodzky, editor, *Arts Canada*; Anita Aarons representing *Architecture Canada*; Professor Leslie Mezei of the Department of Computer Science, University of Toronto; Paul Sommerskill, Ontario Council for the Arts; Avrom Isaacs, Isaacs Gallery, Toronto; William J. Withrow, director, Art Gallery of Ontario; Udo Kasemets and various engineers working in electronics. After a lively and vocal meeting very positive decisions were made for an E.A.T. group to be formed with temporary headquarters at the Art Gallery of Ontario. The first aim, to increase membership by awareness of activity, was to arrange an informal demonstration evening at the studio of artist, Bob Wise, 567 Queen Street, Toronto.

And so to the relevance of this column, which is to make architects, artists, and engineers aware that E.A.T., a new and vital organization, is part of the new scene, and that you may become a part of it. Membership is free, all it costs is curiosity and involvement.

E.A.T. in a very short period has grown to an international level of interest with time and money being contributed by powerful supporters from many countries, Holland, France, Canada and others.

Art and new technology is not organized just for the benefit of artists but is a manifesting interaction between two areas of human endeavor, to quote E.A.T. President Billy Kluver, "The collaborative projects will explore new and relevant uses of technology, they will give the artist and the engineer a new awareness and insight, and they will require the positive involvement of industrial leadership, labor and politics. This interaction will generate a fusing of specializations from which a new responsibility will emerge".

What of the readers of these columns–architects, artists and engineers? Already powerful patrons and curious, imaginative individuals have become interested in taking an active part in this new industrial and art development . . . are you interested? Have you a role major or minor in this vitally stimulating natural development in the social integration of the disturbing sixties.

Two E.A.T. brochures, easily obtainable by membership, contain a great deal of information on activity and development. The positive nature of this growth makes it imperative to "eat" at the source rather than partially digesting from these columns.

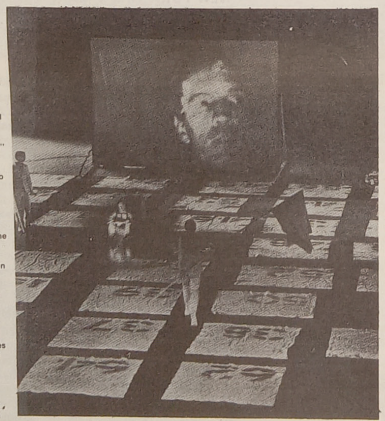
At present, all enquiries may be directed to E.A.T., Art Gallery of Ontario, Grange Park, Toronto.

What interests me is that, from information available, with one exception I cannot find any architects amongst those actively interested in this project. I like to think that in our society the architect is somewhat of an artist-engineer and as such would have a true and proper part on both sides of the fence in such a dynamic force for future society. Is the architect once again "remote and aloof" as once was the criticism levelled against the artist? Is he lagging behind his fellow creators to be with the scene or is it a matter of lack of information and interest? Losing initiatives on all levels will result in the architect becoming the builder of "husks and shells" once designed for living organisms, man of the past, but now inhabited by man of the future adapting himself like a hermit crab to an environment whose original inhabitant is dead.
Is this to be the fate of architecture built by architects who stand aloof from the new movements in aesthetic society?
E.A.T. is food for thought . . .

Anita Aarons

1
A theater and engineering experiment begun as an American contribution to the 1966 Stockholm Festival. After ten months of development, and collaboration between artists and engineers it emerged as a series of performances in New York's 69th Regiment Armory. Painter and choreographer Alex Hay's piece (his face is projected on screen by TV in front of him and artist Rauschenberg carries the flag)

La pièce d'Alex Hay, qui a débuté comme expériment tecnique et théatral, fut la contribution américaine au Festival de Stockholme en 1966. Après dix mois de collaboration entre ingénieurs et artistes elle est maintenant sortie à New York.
Sur l'écran apparaît l'image de l'auteur et en face de lui Rauschenberg, porte-drapeau.



2
Dancer and choreographer Deborah Hay's piece
Deborah Hay, danseuse et chorégraphe



3
Engineer Fred Waldhauer moves flashlight bulb over electronic board which triggers lights and speakers across a room. Studying the correlation of visual reaction to the position of the flashlight bulb are (left to right) artists David Tudor, Deborah Hay and engineer Billy Kluver
Fred Waldhauer en déplaçant l'ampoule au dessus du tableau électronique, délenche les lumières et hauts-parleurs de la pièce. Regardant l'expériment (de gauche à droite) les artistes David Tudor et Deborah Hay ainsi que l'ingénieur Billy Kluver



4
Artists and engineers examine ground effect machine which permits dancers to literally float on a cushion of air with no physical exertion
Artistes et ingénieurs examinent la machine qui permet aux danseurs de flotter sans aucun effort sur un coussin à air



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Vital Results

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THE VILLAGE VOICE, JUNE 27, 1968 EXCERPT

movie journal

by Jonas Mekas

I spent some time at the first national conference of EAT (Experiments in Art and Technology) which took place this weekend at the New York HQs of EAT, 9 East 16th Street. For those who do not know what EAT is, I'll quote them:

"The primary aim of EAT's activities is to develop the most effective means of providing the artist with access to new technology. The focus here is to explore and develop means of stimulating projects for artist-engineer collaboration and to find sponsorship for them. Artists' projects or requests for technical assistance are submitted in writing and reviewed by the Engineering Committee and the staff engineers. The committee determines the technical feasibility of the project and initiates a one - to - one collaborative relationship by matching the artist with a member engineer whose qualifications answer the artist's needs."

The organization, which started a year ago as a brainchild of Billy Kluver and Robert Rauschenberg, has become international in scope, with 35 chapters in 35 locations. It's headed now by Francis Mason, with Kluver and Rauschenberg advising. It publishes a monthly bulletin called EAT (to which more than 4000 engineers and artists subscribe) and is planning a newspaper.

I am reporting on EAT because film - makers are about the least represented in it at this moment. EAT would welcome film - makers to come to them with their problems (and projects). We know that there are all kinds of things that we need. Usually our needs are very simple, like a really workable loop projector, or some other down - to - earth thing like that. Very often we'll discover that everything that we need exists already, only we didn't know where to get it. It's here that EAT may be very useful to us as an information source. But there are bigger and more complicated dreams that we have, too, and we could try to realize them with the help of the scientists. They are ready and waiting, 2000 of them, and they have no projects! You may be, for instance, in Denver or in Philadelphia, needing some engineering advice, and you may not know that there are chapters of EAT in Philadelphia and in Denver, with lots of engineers bored with their lives, and what's more, with all kinds of computers, laser beams, video cameras, doing nothing, with dust gathering on the cellophane bags. You should, therefore, converge on EAT, and test the good wishes, intentions, and the limits of practicality of it all —I mean, of the collaboration between the artists and the engineers. Write to EAT, 9 East 16th Street, New York City 10003.

THE SEATTLE TIMES, JULY 7, 1968

The Visual Arts

Technicians, Artists Pool Their Talents

JEAN BATIE

The Times' Art Reviewer

Last weekend more than fifty persons attended the first meeting of the Seattle chapter of Experiments in Art and Technology; fifteen came all the way from Portland.

Meeting in the Eames Theater at the Pacific Science Center, this group represented an astonishing variety of interests and disciplines.

The single largest group, eighteen in all, were photographers and experimental film makers. There were sculptors, and seven engineers. (One problem the organization has had elsewhere has been the shortage of technically trained people.)

Others in attendance were musicians, printmakers, specialists in plastics, electronic technicians, and art administrators. The list also included one oceanographer, one poet, one playwright, and one specialist in photo-chemistry.

Temporary chairman William Fetter provides for the election of a steering committee. Four short films were shown at the meeting.

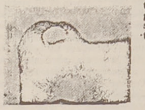
THE GENERAL atmosphere of the E. A. T. meeting was one of excitement and cooperation. One artist-technician offered the group the use of his enormous studio. A technical research specialist offered to make available a vast quantity of information relating to new materials that could be useful in the arts.

Nominated to fill key positions on the steering committee were Mrs. LaMar Harrington, associate director of the Henry Gallery at the University of Washington; James Haseltine, Director of the Washington State Arts Commission in Olympia, and Jack Eyerly, an intermedia specialist from Portland.

THE FIRST of these, "Nine Evenings: Theatre and Egineering," was a film record of the organization's inception in the fall of 1966. At that time, a group of well known artists and engineers in New York City collaborated to produce what is now regarded as one of the most avant-garde events of this decade.

The experiment proved to be so successful that there are now twenty-five E. A. T. chapters in the United States and eight abroad. The purpose of the organization is to provide a clearing house for artists and scientists who would like to work together.

A somewhat simplified film by Norman McClaren showed the use of a computer as an animation device while another by Hans Graff represented a more sophisticated and ingenius collection



Enjoying as it does a greater than average concentration of both scientists and artists, Seattle is one area in the country where a lot could happen when these two groups of people decide to work together seriously in what could well be termed the area of the creative unknown.

THIS MONTH the Northwest Craft Center and Gallery is featuring the work of two unusual potters.

Daniel McClintock is showing ceramic sculpture consisting of hollow vessels with thin spires and tensely curled projections and rectangles are frequently gilded, then mounted on cylindrical bases. Others, like odd trophies, seem to consist of two sections joined together by a slender neck.

The work of Regnor Reinholtsen provides a functional contrast with largfe boxes and jars pleasingly embellished with stars and stripes in red, white, and blue. These are more reminiscent of pop artist Jasper Johns than traditional Americana.

One notable feature about these objects is the manner in which the two sections fit together in an irregular and greatly simplified pattern similar to battlements on a tower.

THE SUNDAY OREGONIAN, JULY 7, 1968

Experiment Unit To Catalyze Cooperation Of Arts, Industry

By BETH FAGAN

Staff Writer, The Oregonian

The first step toward a Northwest group of Experiments in Art and Technology Inc. (EAT) was taken Saturday, June 29, in Seattle when 65 Oregon and Washington people gathered for a meeting in Pacific Science Center.

The meeting was initiated by William A. Fetter of Seattle at invitation of EAT, a non-profit foundation now international in scope which was launched in New York City by artist Robert Rauschenberg and research scientist Billy Kluver of the Bell Laboratories.

It's purpose is complex. But simply stated, it is to "*. . . assist and catalyze the inevitable cooperation of industry, labor, technology and the arts.*"

The Seattle meeting featured a film about the New York development, a talk by James Haseltine, executive director of the Washington State Arts Commission, and election of a steering committee in five areas, composed of people from both states.

They are:

Administrative: Lamar Harrington, assistant director, Henry Gallery, University of Washington, Seattle; Jack Eyerly, art and Intermedia consultant, Portland.

Technicians: Vernon Chi, electronics engineer, Issaquan, Wash.; Bruce Rittenbach, electrical engineer, Portland.

Artists: Doris Chase and Jack D. Large Seattle; Dexter Bacon, Portland.

Resources: Tom Robinson, researcher in opto-electronics, Tacoma, Wash.; Rachael Griffin, curator, Portland Art Museum, Portland.

Advisory: Frank C. Meer, chemical engineer, Bellevue, Wash.

People notified of the Seattle meeting by Fetter, a graduate from University of Illinois in graphic design who became interested in possibilities of the computer as an aid to a number on graphic problems and now works in computer graphics, were those who had already expressed an interest to EAT in New York or to him. Others learned of the session through announcements in the press.

The interest now is expected to gradually become much more widespread in both states.

People at the Seattle meeting included people working in film, photography, dance, theater, graphics, music, ceramics, painting, sculpture, environmental art, music, educators in both science and art and people actively involved with science and technology in industry.

"A great variety of talents," was the way Lamar Harrington summed up attendance.

"The thing we want," she emphasized in projecting EAT efforts, "is not a closed, tight little organization with memberships, dues and all that. We simply want to perform a service, to remove stumbling blocks in paths of artists pertaining to need for all kinds of technical advice from experts and other technical aid.

"One of our main duties will be to bring together the technician and artist. The potential will be there for collaboration — the organization will act as a catalyst."

"What we think will follow is something stimulating and valuable for both sides — the technician and industry as well as the artist."

In his talk, Haseltine also talked of mutual benefits to industry and artists from association and collaboration.

At a date to be announced later, there will be an evening at Portland Art Museum devoted to the EAT development. It is now being planned by Rachael Griffin, and will include the "Nine Evenings" film and other experimental film shown at the Seattle meeting. All who are interested will be welcomed.

Meanwhile, Jack Eyerly will begin sending out a newsletter concerning the development.

NATIONAL OBSERVER, JULY 22, 1968

Experiments in Art and Technology

Artists and Engineers Learn to Work Together as EAT Continues to Grow

NEW YORK CITY.

Experiments in Art and Technology, Inc. (or EAT), continues to confound its critics. Hatched a year and a half ago to achieve the most esoteric and improbable of goals—to bring artists and engineers together in practical, working collaborations—it has taken one long stride after another toward real, breathing life. The latest, conducted here late last month in full public view, was EAT's first international conference, from which emerged the sturdy skeleton of an organization now boasting chapters in points as disparate as Vancouver, Canada, and Sao Paulo, Brazil. "Who would have believed it?" asked a lady delegate from Cleveland. "Why, even the director of our museum seems interested in us!"

EAT is far from maturity, to be sure. But the story of its growth is remarkable. Said Ralph Burgard, director of the Association of Arts Councils, to the assembled EAT leaders: "What you are selling, whether you know it or not, is the great theme of the era: *involvement.* I don't know a good businessman or engineer who isn't pulled in this direction. And you can bring him in touch with something far more important than a museum—a real artist, an individual."

The word at the conference, held in the New York chapter's huge loft on East 16th Street, was that the message is getting across, at least to the engineers. Nearly all the delegates, representing about 35 fledgling groups spread throughout the United States, Europe, and Latin America, reported that their first organizational meetings were heavily attended by engineers, who frequently outnumbered the artists. More to the point, the New York chapter has on file 500 engineers ready to collaborate with artists needing help. For more than a year, indeed, the New Yorkers have been matching the two sides through a number of devices, all sure to be copied by EAT chapters elsewhere. Artists phone or write to the organization, describing their projects, and are given a list of relevant engineers to consult with. Each Sunday, moreover, there is an open house for artists and engineers; each week there is a lecture by an expert—on computers, say, or color theory, or laser beams. By now the EAT membership list, which totals 4,000, contains as many engineers as artists.

Reluctant at First

It wasn't that way at first. EAT sprouted directly from a series of performances, *Nine Evenings: Theatre & Engineering*, produced in New York in the fall of 1966 by a small band of artists and engineers, most of the latter recruited from Bell Laboratories in near-by Murray Hill, N.J. The results, which included a dance accompanied by the internal sounds of the dancer's body and a concert composed by the component instruments themselves, prompted the artists, aided by engineer Billy Kluver, to push for an organization that might afford permanent access to contemporary technology. "At our first two meetings," Dr. Kluver recalls, "we had over 300 artists and just a few engineers. When the engineers were introduced, all the artists applauded." He pauses. "Now it's different. The idea is out."

Over 150 fruits of EAT collaborations will be presented this fall, in conjunction with the Modern Museum's giant show *Art and the Machine.* The show, selected by Pontus Hulten, director of Stockholm's Modesna Musset, will dwell on past triumphs, documenting an interest in the products and processes of modern technology dating back to the Russian Constructivists, who worked before 1920. The EAT exhibition, by contrast, presents works made during the past year, with prizes to be awarded (by Mr. Hulten and a panel of engineers) only to collaborating engineers.

Yet somehow this seems the least exciting aspect of what EAT is doing, this ability to produce works of art not otherwise possible. No, what is exciting is EAT's appeal to all kinds of people and organizations not normally involved with art, least of all with artists. EAT's several administrative committees include politicians (Sen. Jacob Javits among them), scientists, architects (notably Buckminster Fuller), and businessmen. Funds to support its fledgling efforts have come not only from the expected cultural sources, like the New York State Council on the Arts, but from AT&T, IBM, Bell, Xerox, and the Edmund Scientific Co.

Most important of all, EAT has forged an alliance with organized labor—on several levels—that is a historical first. To begin with, lawyer and labor mediator Theodore W. Kheel is chairman of EAT's executive committee; he announced last fall that the American Foundation on Automation and Employment would give office and display space to EAT in its new building, Automation House, now under construction. His support, along with that manifested by Harry Van Arsdale, Jr., president of the AFL-CIO's Central Labor Council in New York City, has spread into the labor movement, with concrete results.

'A Marriage with Local One'

The EAT delegates were invited to tour one of those results: an exploratory lithographic workshop jointly manned by EAT and Local 1, Amalgamated Lithographers of America (ALA). When this project was announced some months ago, Edward Swayduck, president of the union, called it "a marriage between the Venice Bienale and Local One"—referring to the past exploits in international exhibits of artist Robert Rauschenberg, EAT's vice president. The workshop is already well under way, as the delegates learned; seven artists are at work experimenting with new approaches to print making with trained lithographers at their sides.

It is this kind of practical interaction between the artist and businessman, the artist and craftsman, that in time may prove EAT's finest contribution. If EAT can demonstrate, in this way and in countless others, that the artist contributes vision and knowledge to those with whom he works—that, in effect, he can be an active agent in social and economic life as well as cultural life—the age-old stereotype of the "removed" artist will crumble. One of EAT's next steps—indeed, the reason for branching out on national and international levels—must be a step into industry itself. "It's more than just getting industrial support," EAT president Francis Mason told the delegates. "We want to help artists get inside industry, working directly with personnel and materials, in the manner of our ALA workshop. That's one reason why we have to decentralize. Artists will move anywhere they find a welcome, industrially, from San Francisco to North Carolina. We think we can get everyone moving around."

At its best, the moving will be accomplished with the light hand that has so far characterized EAT's growth. At least in New York the organization seems genuinely afraid of itself, genuinely determined to avoid becoming some kind of esthetic czar in the manner of the old Bauhaus school, which first tried, four decades ago in Germany, to bring artists and technology together on a large scale. Billy Kluver keeps saying, over and over, that EAT's only object is to bring artists and engineers together. "What happens later is not our business," he told the conference. "We're not interested in art at all, only in the *process.*"

—DOUGLAS M. DAVIS

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REALITES, AUGUST 1968

expériences

L'ART "TECHNOLOGIQUE" DE RAUSCHENBERG

A travers une tentative américaine originale, celle du EAT (Experiment in Art and Technology), les artistes modernes commencent à travailler avec des ingénieurs à des œuvres communes. Un peintre, Rauschenberg, un ingénieur, Billy Kluver, témoignent de leurs découvertes réciproques * par Alain Hervé

Robert Rauschenberg est un des plus illustres artistes américains. Grand prix de la Biennale de Venise 1964, il est surtout connu pour ses « Combine paintings » qui, à partir de 1954, ont fait la transition aux Etats-Unis entre l'expressionnisme abstrait d'un Pollock (voir « Réalités » avril 1965) et le pop art.

Voici ce qu'il vient de présenter à Bruxelles : un nouveau développement de sa recherche, une machine électronique de dix mètres de long (voir page de droite) qui réagit aux sons émis par le spectateur : quand il y a silence absolu, celui-ci se reflète dans l'œuvre comme dans un miroir ; dès qu'il parle, des lampes s'allument qui éclairent une vaste composition de chaises photographiées sous tous les angles. L'effet est surprenant. Il n'a été possible que grâce à la collaboration d'un artiste particulièrement inventif et d'un groupe d'ingénieurs électroniciens.

Ce nouveau type de dialogue est de plus en plus fréquent des deux côtés de l'Atlantique. En Europe s'y sont engagés des hommes comme Schöffer (cybernétique) ; Takis (ondes magnétiques) ; Agam (ondes lumineuses) ; Martial Raysse (circuits fermés de télévision) ; Alain Jacquet (photo en relief dite hologramme), etc. Aux Etats-Unis, c'est toute une association qui s'est créée : E.A.T. (Experiment in art and technology) pour faciliter les contacts entre ingénieurs et plasticiens. Le président en est Billy Kluver, ingénieur de la Bell Telephone, spécialisé dans le laser ; le vice-président, Robert Rauschenberg. Voici ce qu'ils ont répondu aux questions de « Réalités ».

Rauschenberg

« La technologie est le paysage de notre époque... »

« Pourquoi la technologie ? Parce que c'est le paysage de notre époque et que nous sommes de plus en plus influencés par elle. Actuellement, on la cache, on la déguise sous des enveloppes rassurantes. Le nouveau matériel, quand il pénètre dans notre vie quotidienne, on s'arrange pour qu'il ressemble à l'ancien. Regardez votre téléphone : une vieille sculpture. Il y a ce préjugé : le progrès technique, c'est le mal. Dans les films, le robot est toujours le sale type. L'artiste doit combattre une telle attitude, montrer la technologie comme l'aventure du monde moderne, s'en servir pour mettre en valeur les réalités qui nous conditionnent, tout ce champ d'ondes et de molécules que nous ne percevons pas à l'œil nu mais qui grouille autour de nous.

» Pour cela, il faut la coopération de l'industrie. Non pas des mécènes, ces gens un peu condescendants qui vont au ciel parce qu'ils vous ont nourri, qu'ils ont acheté vos œuvres. Ce que nous cherchons c'est la collaboration d'égal à égal avec des ingénieurs, l'échange des cerveaux.

» Les scientifiques sont souvent collés à leurs expériences, bloqués sur une voie unique. Nous leur donnons les moyens d'en sortir. Imaginez que vous êtes un très bon ingénieur électronicien. Vous rentrez chez vous après le travail, vous retrouvez votre femme et vos enfants, vos voisins qui jouent au bridge. Personne ne parle votre langage. La société vous demande de vous arrêter de penser brusquement, à 17 heures - jusqu'à demain. Absurde. Alors, vous venez travailler avec nous. 80 % des expériences que nous ferons ensemble seront des échecs - invendables pour la plupart. Normal, c'est ce qu'on appelle la recherche. Mais il y aura des réussites, même sur le plan technique, des applications auxquelles vous ne pensiez pas.

» Je voulais, pour une pièce de théâtre, un grand écran vivant qui se modifierait en fonction de la chaleur dégagée par les acteurs. Une idée d'artiste. J'avais deux chimistes avec moi. Finalement, je n'ai pas utilisé le projet. Mais les chimistes, eux, se sont précipités dessus. Ils l'ont adopté pour l'industrie. Maintenant plusieurs usines s'en servent pour détecter les vagues de chaleur dans les laboratoires et les ateliers. C'est un exemple : au lieu de travailler chacun dans sa petite boîte, son petit crâne, nous nous sommes mutuellement apporté un supplément d'imagination.

» C'est pour cela que nous avons fondé EAT. Nous avons maintenant plusieurs centaines d'ingénieurs disposés à travailler avec nous dans toutes les branches de la science et de la technique : mille artistes et une équipe permanente de quinze personnes. Budget : deux cent mille dollars par an, payés par différentes fondations. Le rôle de EAT : mettre en contact artistes et ingénieurs ; enregistrer les problèmes techniques des premiers, leur faire connaître, parmi les seconds, l'homme capable de les résoudre.

» Cent œuvres sont en cours de réalisation. Robert Whitman a utilisé le laser pour une des expositions les plus étonnantes de l'année, chez Pace, à New York. Nous sommes optimistes. Bientôt, le staff régulier des galeries et des musées va changer de composition.

» Le plus difficile : convaincre les industriels. Pendant un an et demi, je suis allé de bureau en bureau, de déjeuner en déjeuner. C'est une expérience : débarquer chez Xerox, I.B.M. (très important pour nous à cause des computers) ou Western Electric et leur dire : « Prêtez-nous vos ingénieurs. Nous allons faire des merveilles. » J'y allais avec Billy Kluver, président de EAT, un cerveau de la Bell Telephone. On s'expliquait. Peu à peu nous avons convaincu beaucoup de gens. A notre conférence de presse, chez moi, en octobre dernier, il y avait des représentants des syndicats d'A.F.L.-C.I.O., le sénateur Javits, Ralph Gross, président de l'Association du commerce et de l'industrie, ainsi que des scientifiques du Massachusetts Institute of Technology. Bob Kennedy a envoyé un message.

« Outre l'obligation de faire de l'argent, a déclaré Ralph Gross, les businessmen américains ont aussi le devoir d'être de bons citoyens. Ils doivent soutenir les arts et dialoguer avec les artistes. » C'est ce que nous voulions leur faire comprendre. Il me semble que nous avons réussi... »

Billy Kluver

« Pour être modernes, les artistes dépendent maintenant des ingénieurs... »

Dimanche à New York, dans un immeuble sordide de Downtown à Manhattan - 16e rue East - des fanatiques se réunissent. Ils montent sans souffler les six étages, entrent sans frapper à l'EAT puisqu'aussi bien n'importe qui est invité.

Il y a là, assis sur des bancs inconfortables, ou par terre, deux céramistes, un peintre, un professeur d'art dramatique, deux ingénieurs électroniciens, un photographe, des curieux, une foule qui va et vient, pose des questions, suggère des propositions. Kluver est assis au centre d'un groupe attentif ; le front largement dégarni, la voix basse, il répète :

« EAT est seulement un poste d'aiguillage, nous n'avons aucune autre prétention. Les artistes veulent utiliser les techniques disponibles de leur époque. C'est des ingénieurs qu'ils dépendent pour y accéder comme autrefois ils dépendaient des artisans. Sans bois, sans technique du bois, pas de violon, pas de Jean-Sébastien Bach. Sans matériel électronique, sans connaissances techniques, pas de Stockhausen, pas de Pierre Henry. »

Sur le thème « theater and engineering » Billy Kluver organise en 1966 un *happening* qui secoue l'actualité artistique new-yorkaise : les *Nine evenings*, les neuf soirées, une grande fête, financée par la Bell Telephone Company. Elles coûtèrent cent vingt-cinq mille dollars. Quinze mille personnes y assistèrent. On y vit John Cage, le compositeur célèbre pour ses « pianos préparés » qu'éventuellement il brise sur scène à coups de barre de fer, composer et conduire un morceau musical intitulé « Variation VII » dont il avait au préalable enregistré les éléments au zoo, au restaurant et auprès d'un ventilateur électrique.

Steve Paxton invita le public à pénétrer dans de gigantesques structures en plastique pour s'y trouver assaillis de sons et de lumières.

Yvonne Rainer dirigea ses danseurs transformés en robots, avec des micro-récepteurs radio qu'ils portaient au poignet.

Bref on tenta d'aller plus loin, avec de nouveaux moyens d'expression. L'idée de EAT était lancée, bientôt reprise dans toute l'Amérique - dans le Connecticut, à l'université du Michigan, à San Francisco, à Minneapolis. Et tout de suite se posa la question : qui serait désormais l'auteur de l'œuvre le peintre ou l'ingénieur ?

« Moi, dit Kluver, j'ai signé avec Tinguely en 1960 la machine qui se détruisait elle-même, mais c'est une question d'appréciation. On trouve tout naturel qu'au générique d'un film le nom des cameramen figure après celui du metteur en scène. Le cinéma est l'exemple parfait d'une collaboration technicien-artiste et de leur fusion. L'artiste devient technicien et inversement. On peut imaginer un tableau ou une sculpture signée par une équipe. »

Mais d'autres œuvres requièrent déjà l'utilisation de phénomènes ondulatoires, magnétiques, vibratoires, d'hologrammes ou de lasers - et donc encore plus de technique... Y a-t-il des limites à l'introduction de celle-ci dans les arts ?

« Une seule, répond Kluver : l'imagination de l'artiste lui-même. Plus ses problèmes sont spécifiques, plus intéressants ils sont pour l'ingénieur et plus efficace sera l'aide apportée. Nous ne demandons qu'à nous mettre au travail et à répondre à tout « challenge » de nos amis les peintres, les sculpteurs, les musiciens d'aujourd'hui. »

THE SUNDAY OREGONIAN, AUGUST 18, 1968

EAT Attendance Growing



PHOTO taken at one of the weekly 7:30 p.m. Sunday meetings of Experiments in Art and Technology Inc. (EAT) at Patton Park, 5340 N. Interstate Ave., indicate informality of sessions which are bringing an increasing number of people in the arts and people of science and industry into dialogue with each other. Sessions, which are also being held in Seattle since Northwest regional offshoot of the international EAT was formed at Pacific Science Center, Seattle, are open to all interested persons. Jack Eyerly is local coordinator of EAT.

THE NEW YORK TIMES, SEPTEMBER 19, 1968

$75,000 IN GRANTS TO SPUR ART TEST

Union With New Technology Is Aim of Program

By GRACE GLUECK

Experiments in Art and Technology, Inc. (EAT), an organization formed two years ago to help provide artists with access to new technology, announced yesterday that it had received grants of $50,000 from the National Endowment on the Arts and $25,000 from the Rockefeller Brothers Fund.

At a news conference in its loft quarters at 9 East 16th Street, the organization also announced that it had begun a collaboration with an industrial corporation on an artist-in-residence program, and disclosed plans for a show of art works that incorporate technology.

Francis S. Mason, president of EAT, said the grants would be used "to promote collaboration among artists, scientists and engineers on projects that explore and expand the use of new technology as a material in works of art."

The grant from the National Endowment, given "to encourage the developing partnership between the artist and technology," must be matched by funds from other sources.

Specific programs to which the new funds will be applied include development of an information retrieval system to provide artists with rapid answers to technical questions, the continued development of EAT into a national organization with local chapters throughout the country, and the provision of technical advice and consultation for museums, galleries and private collectors on works incorporating new technology.

Residency for a Year

The artist-in-residence program, in collaboration with the Singer Company, will enable a technologically oriented artist to use the facilities of the Singer Central Research Laboratories in Denville, N. J., over a period of a year.

From among four candidates proposed by EAT, the company has chosen Mel Bochner as its first artist-in-residence. Mr. Bochner, a 28-year-old graduate of the Carnegie Institute of Technology, has exhibited and published articles on "series" art based on various number systems.

Mr. Rochner's first project will be to transpose color into computer language. He will be working with Edwin Webb, a senior engineer at the laboratories.

"Some More Beginnings," the exhibition, will open Nov. 25, and run concurrently with a historical survey show at the Museum of Modern Art called "The Machine."

The exhibition has grown out of an international competition held by EAT last year for the best collaborative work between an artist and an engineer. Nearly 150 entries from 19 states and 9 foreign countries were submitted. They include paintings, reliefs, sculptures, constructions, environments and films.

About 10 of the works will be exhibited in the Museum of Modern Art show, and the rest at the EAT exhibition, tentatively scheduled to occupy showroom space in the old General Motors Building, 1775 Broadway. Competition winners will be announced at the exhibition's opening.

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célèbre pour ses « pianos préparés » qu'éventuellement il brise sur scène à coups de barre de fer, composer et conduire un morceau musical intitulé « Variation VII » dont il avait au préalable enregistré les éléments au zoo, au restaurant et auprès d'un ventilateur électrique.

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THE CITIZENS OF MORRIS COUNTY, SEPTEMBER 26, 1968

Computer Art Arrives

Singer Sewing Art to Science

By ELIZABETH SODOMA

DENVILLE - It's a giant step from the pedal on the treadle of a sewing machine to a scanner that converts color to computer symbols.

This week, 117 years after its founding, the Singer Company announced it is introducing the artist to the possibility of expressing himself through the computer and various output devices to which it may be connected.

Artist-in-residence at the company's Central Research Laboratory on Route 53 for the coming year will be Mel Bochner, who will work with physicist Edwin Webb of Boonton.

The program is being developed in collaboration with Experiments in Art and Technology, Inc. (EAT), a non-profit organization formed five years ago to help provide artists with access to new technology. It recently received grants totaling $76,000 from the National Endowment on the Arts and the Rockefeller Brothers Fund.

As explained by Harry Fuge, director of corporate-related research, "The Singer Company is deeply involved in the expression of art through technology. For over a century our household sewing machines have helped individuals express creativity through personal clothing. Now, our fabric forming and industrial sewing machines help the commercial artist express his designs in forms economical enough to be mass produced."

Mr. Fuge adds, "We'll examine the process by which the artist creates art and see if his creativity-his soul, if you will-can be connected to the output of the computer.

"We consider this to be part of a long range research program and can't predict what the results will be. However, it's possible that the computer will first act as a mind expander and later that a dexterity expander."

Far reaching artistic effects are possible, Mr. Fuge, who is also chairman of the Imaginative Use of Computers for the American Manufacturers Association, explains. "Reproductions of art works now depend on creation of duplicates. But a computer is dynamic and it's conceivable that artistic process could become so condensed that endless variations could be produced-each an original. For instance, imagine computer controlled machine tools doing the manual work of turning out a block of sculpture."

"My whole outlook on art has exploded," says physicist Webb, who is assigned to working with artist Bochner two days a week, "even after only a couple of sessions with Mel. One thinks all week or what has happened."

Mr. Bochner, a 28-year-old graduate of the Carnegie Institute of Technology, has exhibited and published articles on "series" art based on various number systems.

Mr. Webb describes the artist's technique as "working with mathematical sets in exhausing arrangements."

He explains part of their explorations as investigation between quality and quantity, including a whole scale of subjective values.

Scientist Webb has a poetic passion for his work which he expresses in free, unmetered verse.

"Quantity does not beget quality - but peppers the soil from which it grows."

Or, as Mr. Webb puts it in prose, "You have to mess around with an awful lot of stuff before you hit on productive growth."

THE KEY, THE GREATER MIAMI CULTURAL ARTS CENTER, OCTOBER 15, 1968

ARTISTS, SCIENCE, INDUSTRY JOIN IN NEW EXPERIMENTS FOR ART AND TECHNOLOGY

by ELWIN PORTER
Director, Art Institute of Miami

Last May I was exposed to a relatively new concept in the slow process of collaboration between art and technology. Called "Nine Evenings," the program was held in the audio-visual room of the Barry College Library and was sponsored by the Greater Miami Cultural Arts Center.

Experiments in Art and Technology (EAT) is an international organization comprised of artists, engineers, physicists, chemists, technicians, industry and labor. EAT is an alliance of art and science, and it is intended to bring modern technological tools to the artist for creation of new art forms. It provides the mechanism and avenue for a mutual understanding and cooperation between the artist, the scientist and industry. It bridges the gap between art and technology.

The main purpose of EAT is to present the artist's problems to the scientist for a solution and to contact industry and labor for the proper financial backing. EAT local and correspondent groups are in the process of being organized in locations throughout the U.S., Canada and abroad. An EAT group, aware of local resources and responsive to local needs, can create a vital environment for successful collaboration.

(Last month EAT announced it had received grants of $50,000 from the National Endowment on the Arts and $25,000 from the Rockefeller Brothers Fund. Given to "encourage the developing partnership between the artist and technology," the grant must be matched by funds from other sources.)

EAT is concerned with the procer of making art and not with the work of art as a final product. Its concern is to facilitate contact between the individual and the new technology and promote experimental application of new technology in the human environment. Dr. Billy Kluver and Robert Rauschenberg play a major roll in formulating policy of EAT as Chairman of the Board of Directors and Vice-Chairman, respectively.

At that time they discussed the creation of EAT, Miami. The question of realistic financial assistance and facilities was left up in the air. A need, therefore, was created for local people interested in participating at two levels: 1) as artists and 2) as technicians.

Artists would include: fine artists, sculptors, musicians and members of the performing arts. Technicians would include: mathematicians, chemists, physicists, biologists, geologists logicians and computer programmers.

The Art Institute of Miami is endeavoring to promote genuine interest in the unbelievable possibilities of this project, and there are no limitations to the fields which we can become involved. Anyone interested in this project, please contact the Art School prior to the first meeting which will be held on November 13th at 7 P.M. The address of the school is 7808 N.E. 2nd Ave., Miami, telephone 754-5688.

SEPTEMBER 19, 1968

advice and consultation for museums, galleries and private collectors on works incorporating new technology.

Residency for a Year

The artist-in-residence program, in collaboration with the Singer Company, will enable a technologically oriented artist to use the facilities of the Singer Central Research Laboratories in Denville, N. J., over a period of a year.

From among four candidates proposed by EAT, the company has chosen Mel Bochner as its first artist-in-residence. Mr. Bochner, a 28-year-old graduate of the Carnegie Institute of Technology, has exhibited and published articles on "series" art based on various number systems.

Mr. Rochner's first project will be to transpose color into computer language. He will be working with Edwin Webb, a senior engineer at the laboratories.

"Some More Beginnings," the exhibition, will open Nov. 25, and run concurrently with a historical survey show at the Museum of Modern Art called "The Machine."

The exhibition has grown out of an international competition held by EAT last year for the best collaborative work between an artist and an engineer. Nearly 150 entries from 19 states and 9 foreign countries were submitted. They include paintings, reliefs, sculptures, constructions, environments and films.

About 10 of the works will be exhibited in the Museum of Modern Art show, and the rest at the EAT exhibition, tentatively scheduled to occupy showroom space in the old General Motors Building, 1775 Broadway. Competition winners will be announced at the exhibition's opening.

LA PRESSE, MONTREAL, OCTOBER 1968

EAT: le mariage heureux de l'art et de la technique

Par Normand Thériault

Schéma des circuits électroniques qui ont servi à la réalisation de "Open Score" de Rauschenberg, Liberté d'expression, mais calcul des moyens.

NEW YORK, Octobre 1966. L'intérieur du 69th Regiment Armory. Un spectateur parmi mille autres assis dans une estrade. Devant lui, une partie de tennis pas ordinaire vient de débuter. Lorsque la balle touche les raquettes, selon la force du bruit, l'éclairage baisse ou augmente en intensité. La partie se termine et tout devient noir. Il n'y a plus rien. Ce n'est qu'illusion. L'écran géant, qui transmettait jusque là la partie, alimenté par un système de télévision en circuit fermé, montre maintenant une danse groupant quelques centaines de participants, invisibles des estrades. Puis c'est la fin. Applaudissements.

Cette pièce, intitulée "Open Score", avait été rendue possible grâce à la collaboration de Robert Rauschenberg avec Jim Mc Gee, ingénieur. Seul, Rauschenberg n'aurait pu obtenir ces raquettes équipées de cadre pour la transmission des sons, un éclairage à l'infrarouge, invisible à l'oeil humain, pour la transmission d'images dans le noir; il eut alors été impossible de proposer ce jeu sur la relativité de la perception et de la réalité obtenu par l'utilisation d'un moyen-terme technique.

La manifestation s'inscrivait dans un ensemble beaucoup plus vaste: "9 evenings: theatre and engineering". Les dix spectacles qui occupaient les soirées groupaient dix ingénieurs et quarantes artistes dont Steve Paxton, Alex Hay, Yvonne Rainier, Oyvind Fahlstrom, Lucinda Childs, John Cage, Les Levine, Frank Stella et ce, parmi les plus connus. $30,000 de matériel sans compter le temps des spécialistes, avait été mis à contribution. C'était le fruit de 6 mois de travail et de rencontres, après que le projet d'une participation américaine de ce genre eut été envisagé pour le Festival d'Art et de Technologie de Stockholm, puis abandonné, faute de temps.

Mais le responsable, Billy Kluver, tenait toujours à rapprocher ces deux formes de découverte: art et technologie. Spécialiste en rayons Laser, aux Laboratoires Bell, il avait déjà travaillé avec Tinguely pour réaliser son "Homage a New York". De plus, Rauschenberg était là pour le seconder.

Pourquoi ce rapprochement? Était-il nécessaire? Qu'apportera-t-il à l'art? Kluver, dans une interview pour "Art in America" (janvier-février 1968), voit plusieurs possibilités.

Au plan esthétique, "La fonction de la technologie, comme outil, ne consiste pas en la mise en formes nouvelles de concepts esthétiques connus, mais de point de départ vers une nouvelle esthétique, qui aurait des relations organiques avec le monde contemporain".

Au plan social, "Pour assurer à l'artiste le statut de l'ingénieur. On ne le jugera pas seulement en terme d'échec ou de réussite basé sur les simples apparences". A ce moment, l'échec d'une "machine", comme celle de Tinguely, ne sera plus important devant "les riches et nombreuses possibilités qu'offre la technologie". On découvrira tout le plaisir qu'amène l'art et la technique. Les premiers artifice chinois, il y a 3,000 ans, sont peut-être le premier emploi d'une technique avancée pour rendre une poésie, un mystère et un plaisir".

La fondation de l'EAT

Mais le monde scientifique a dépassé le niveau du "partagé". Il est beaucoup plus vaste et complexe. Les spécialistes, plus nombreux, sont aussi plus différents. Pour les artistes, la préparation des "9 evenings", les avait convaincus de la nécessité d'une collaboration avec les ingénieurs. Aussi, en novembre 1966, une rencontre décida de la fondation de l'EAT: Experiments in Art and Technology.

Tout ingénieur ou artiste intéressé n'aurait plus dès lors qu'à s'adresser à l'EAT qui lui permettrait de rencontrer un partenaire de l'autre discipline en vue d'un projet commun. De plus, l'EAT s'occuperait d'intéresser l'industrie pour en assurer la réalisation.

Pour y parvenir, l'EAT chercha des appuis dans le monde du travail, des universités, des "fondations", et même de la politique. Ainsi, on obtint l'aide de l'AFL-CIO, American Telephone and Telegraph, IBM et de plusieurs firmes moins bien connues. Le sénateur Jacob K. Javits les appuya ouvertement. Tout est fait pour établir l'EAT sur une base solide.

Outre la mise sur pied de projets particuliers, l'EAT vise à renseigner ses membres par un programme d'échanges professionnels, de conférences, d'exposés et de démonstrations (le film par ordinatrice, physiologie du son, la perception de la couleur). Elle diffuse de nombreux renseignements sur les ordinatrices, et tente d'ouvrir à ses membres les bibliothèques techniques. Tout cela pour les sensibiliser au mode de la technologie.

Et pour se donner un lieu de rencontre et de manifestation, l'EAT, en accord avec la "American Foundation on Automation and Employment", s'installe dans les locaux de l'Automation House. Dans auditorium, de télévision. Sans parler des possibilités techniques

De nombreux artistes ont répondu à l'appel de l'EAT, venant d'un peu partout, dans le monde. Aussi, on fonde des groupes locaux. Faits à l'image de l'EAT de New York, ils doivent assurer les mêmes services. A une échelle moindre. Présentement, l'EAT existe dans toutes les grandes villes américaines, et même en Europe et au Japon.

Au Canada, à Toronto, à Vancouver et à Montréal. Pour Montréal, Mike Goldberg voit à organiser des réunions où artistes et ingénieurs pourront se rencontrer et élaborer des projets. Il aura aussi à trouver les fonds financiers nécessaires.

Mais pour garder contact et créer un climat général, l'EAT prévoit des manifestations majeures et des rencontres internationales. La première eut lieu à New York, en juin. La seconde, en accord avec Intermedia, se tiendra à Vancouver, en février 1969. Elle s'intitulera "Live Sounds from Anywhere: An Experience in Communication". Aussi, l'EAT collabore avec le Museum of Modern Art de New York, à qui il fournira des pièces provenant de ses membres pour la réalisation de "The Machine"; exposition où se fera un survol historique de la relation art-machine et la présentation de pièces contemporaines.

Collaboration ou révolution

Cependant, si l'EAT ouvre de nouvelles voies, il reste à se demander ce que sera son action. Car, à l'heure actuelle, face à la contestation européenne, dans le domaine des arts même, face à la situation mondiale, l'EAT prétend-il apporter des solutions? Je n'ai pas de prétention face à la collaboration entre l'art et la technologie. Elle ne donnera pas nourriture et logement et

Mais l'EAT se veut quand même une solution. Dans son propre bulletin, le "EAT News", on définit une position en trois points.

"Maintenir un climat constructif pour la reconnaissance de la nouvelle technologie et des arts par une collaboration intelligente entre des groupes développés de façon non réaliste dans l'isolement"

"Eliminer la séparation entre l'individu et les changements technologiques et étendre et enrichir la technologie par l'apport de la variété individuelle, du plaisir et de voies pour découvrir et s'inscrire dans la vie contemporaine".

"Encourager dans l'industrie l'initiative en produisant des prévisions originales, au lieu de compromis dans des moments de repain, et accélérer vers un accord mutuel pour éviter les pertes qui découlent d'une révolution culturelle".

Rapprochement entre spécialistes. La technologie pour plusieurs, éviter les pertes de temps et de matériel. Ceci tient de l'optique américaine d'une société instruite et avancée. Chacun a là-dessus sa propre opinion.

En ce qui a trait à l'oeuvre d'art, elle sera le produit d'une coopération, mais ne se trouvera pas nécessairement transformée, au plan des définitions. D'ailleurs, "l'EAT se préoccupe de l'oeuvre d'art au niveau de sa fabrication et non comme produit fini". Et c'est toujours à l'individu que revient le dernier mot, comme individu. A lui d'être social. L'EAT n'est pas un art, mais une structure.

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BELL LABS NEWS, NOVEMBER 15, 1968

Lasers, Computers Star in Mod Art Shows

NEW YORK CITY—Artistic works by several BTL employees will be displayed in separate shows at the Museum of Modern Art and the Brooklyn Museum, beginning later this month. Most of the works are collaborations with artists in which the engineers and scientists made creative technical contributions.

Works by Murray Hill's Tracy Kinsel, Per Biorn, and Leon Harmon and Ken Knowlton are among nine selected from about 160 entries in a contest sponsored by EAT—Experiments in Art and Technology—an organization that encourages collaboration between artists and scientists. The exhibits will be part of a show at the Museum of Modern Art entitled "The Machine: As Seen at the End of the Mechanical Age." The show will run from Nov. 25 through Feb. 9.

Some 130 entries from the EAT contest, including the works by the four men and six others by BTL employees, will be exhibited at the Brooklyn Museum from Nov. 25 to Jan. 5.

The six additional exhibits are by Dick Wolff, Manfred Schroeder and Sue Hanauer, Jerry Spivack, Lloyd Kreuzer, Eric Rawson and Larry Heilos, and Ken Knowlton.

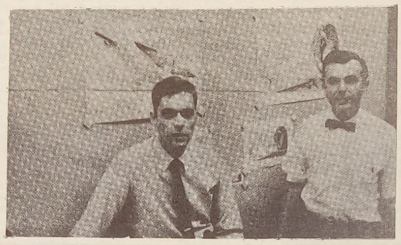
Per Biorn, who worked with artist Lilian Swartz, is exhibiting a black box topped by a two-foot high plastic dome, upon which 80 intermittently shimmering abstract paintings are projected for eight-second periods. "As an observer steps up to my exhibit," Mr. Biorn explains, "the dome slowly sinks into the black box—like a setting sun. The abstract projections can then be viewed by looking down into the box."

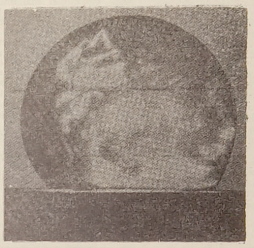
Tracy Kinsel, collaborating with artist John Anthes, produced a kinetic laser sculpture. According to Mr. Kinsel, "various intricate three-dimensional laser patterns are produced on a revolving screen in response to electrical signals. The electrical signals can be obtained from any stereo music source, such as FM radio, organ tones, or taped music. The signals control two mirrors that deflect the laser beam onto the screen."

Leon Harmon and Ken Knowlton will display three of their computer-generated pictures: a nude, sea gulls, and the gargoyles from the Notre Dame Cathedral (the last two can be seen in the Murray Hill concourse).

"A device like a TV camera scans a photograph which is then represented by numbers on a digital tape forming an input to the computer," Mr. Harmon points out. "The computer then differentiates between 16 possible brightness levels from white to black for each of many tiny fragments of the picture. The computer randomly selects from several symbols for each brightness level and produces six microfilm segments which are fitted together for a complete picture."







COLLABORATIONS—Works by Tracy Kinsel (top), Ken Knowlton (l) and Leon Harmon (bottom left) and Per Biorn (bottom right) will be among art works displayed at Museum of Modern Art.

NEW YORK TIMES, NOVEMBER 28, 1968

Art: Machines Fascinate

Artifacts Upstage Their Human Aides—General Effect Is That of a Carnival

By JOHN CANADAY

IT takes a bit of doing for the Brooklyn Museum to make the Museum of Modern Art resemble an archeological dig, but that's what's happened. The Modern's superb new historical show, "The Machine as Seen at the End of the Mechanical Age," begins with Leonardo da Vinci's schemes for aircraft as a preface, races through the next 500 years' touching the high spots, and then settles down to examine in detail a problem in esthetic and spiritual disorganization — the union, seldom happy, between art and the machine in our century. The survey winds up with a group of prizewinning contraptions from a competition of works by engineers and artists united in an organization called E.A.T.—Experiments in Art and Technology. This is where Brooklyn takes over. The competing contraptions, winners and losers, are on exhibition there.

The fifth floor of the Brooklyn Museum looks and sounds like the midway of a carnival of the future as envisioned in a science fiction comic. All the customary elements are present except old-fashioned cotton candy, for which no plastic substitute has been found. There are the flashing lights, the booths, the hash of conflicting noises — shots, music, bleating, jingling, beeps, and burps. The place is one tremendous electronic Katzenjamer Kastle, complete with trick mirrors, wind machines, and even a variation on the Tunnel of Love, if you feel like crawling through the convolutions of a long inflated plastic tube.

Having assumed the obligations of host over the weekend to two boys aged eight and five, I could not welcome the Brooklyn show with more enthusiasm. I figure that I can give those children a couple of bags of pemmican, and shoot them the way to the water fountain and the restroom, and leave them there until Monday morning. As an art critic, however, I am in a more difficult position. Just how seriously am I obliged to take this circus?

I prefer it as a circus to the new glamorized Ringling but I somehow cannot make it seem very new or very adventurous. Every morning when I come to work I have a tussle with the electric eye that operates the elevator door, to the end of rescuin, myself or a colleague from bisection. This is just about all the audience participation I require, and it has the advantage of serving a practical end, whereas no great end is served by a gadget in a museum that recognizes your presence with a hiccough when you intercept a ray of light. Art does not have to serve a practical end, of course, but I cannot feel that electronic gadgets so far have served an artistic end above the midway level. Technically esoteric, they are from any other point of view tricky and vulgar.

But they are enormously entertaining, and a degree of faith may be put in them as a form of pop art. Historically they are fascinating manifestations of our unrelenting reluctance to admit that the machine is its own master, and ours, and cannot be subjugated to the standards accepted as art's. The machine always wins. The Museum of Modern Art's show is important because it demonstrates, although it does not set out to do so, that in a union of art and the machine, art seldom achieves the rank of partner. It is usually a parasite, and more often than not a deforming or deformed one.

Machines are beautiful as themselves, independently beautiful, and I suspect that the best shows, the most beautiful shows, related to the kind of thing now on view in Brooklyn, take place in no museum but in laboratories—just as, in the Museum of Modern Art's show, none of the paintings or sculptures of the last half-century can rival the beauty of the machines that inspired them, either as a revolt against technology or an effort to fuse with it. But if this is defeat and submission, never before have defeat and submission been such fun.

NEWSDAY, NOVEMBER 30, 1968 EXCERPT

ON THE ARTS

EMILY GENAUER

INSTANT HISTORY AT THE MOMA

THE Museum of Modern Art, more fondly known in art circles as MOMA, continues to function in her relatively new role of parent-teacher. Only yesterday, it seems, she was still the youthful rebel whose founding, almost 40 years ago, changed the course of art history.

Now what she's doing is not making art history but recording it. With museums and galleries all over the country knocking themselves out to exhibit the new art-out-of-technology, the Museum of Modern Art has decided to put on an exhibition surveying the whole phenomenon, going all the way back to Leonardo da Vinci.

I'm not complaining. What was chiefly wrong with the survey-exhibition of optical art the museum presented a few years ago, was, I wrote at the time, that there was next to no indication in it that artists have been aware of and employing the devices of optical illusion for a couple of thousand years.

But now MOMA has gone too far. Much the largest part of this exhibition, hailed by its president, William Paley, as the most important in its history, is devoted to works MOMA has been exhibiting on its own premises since the '30s. They've turned up in such famous survey presentations as "Cubism and Abstract Art" and "Fantastic Art, Dada and Surrealism."

Still, the new exhibition does two important things. I'm reminded of Santayana's comment, in "The Life of Reason," that "Those who cannot remember the past are condemned to repeat it." There are a lot of new art lovers who don't remember the past, and many more who are too young to remember it and need this dose of instant history.

The show's second accomplishment is that after its important but much too lengthy historical section, it goes on to present a few examples of an entirely new technological art which is full of excitement, and can really be viewed in depth only at a simultaneous exhibition being presented at the Brooklyn Museum.

The thesis behind the Modern Museum show, which is titled "The Machine as Seen at the End of the Mechanical Age," is that the kind of machine which was essentially an imitation or extension of muscle power, whether of man or animal, is on the way out. Now we're confronted with a new kind of technology, whose devices, like computers and laser beams, aim to imitate the processes of the brain and nervous system.

Artists have been worrying about the machine since its beginnings among the early Greeks. The Modern Museum show starts chronologically with Leonardo da Vinci's drawings of flying machines, and goes on to 16th-Century woodcuts of things like cog-wheel chariots, made for triumphal processions by artists as distinguished as Albrecht Durer.

FOR centuries artists continued to be obsessed by the machine. It represented an escape from the realities of the grim world. But it could also enslave and brutalize. There's a 17th-Century etching in the show by an artist called Brachelli, in which man and the machine become one. A 1920 watercolor by George Grosz depicts a man with a machine where his heart should be. Jacob Epstein in 1913 did a sculpture called "The Rock Drill," which shows man as a machine for mechanical production, but suggests he's a sex machine, too.

The Italian futurists tried in the fragmented forms of abstract painting and sculpture to convey the dynamics of motion. The Russian constructivists, about the time of the revolution, saw the machine as a symbol of their brave new world. Many artists, like Robert Delauney and Fernand Leger, just saw machinery as part of the changing urban scene, although they stylized its shapes to capture something of machine-age tensions.

Some of the wittiest and most original creative imaginations in recent years have seen the machine as a joke rather than as an enemy, necessary nonsense that we must live with but would be fools to worship. Yves Tinguely is perhaps the best-known example of this kind of artist. Among several pieces Tinguely has in the present show is a complicated machine whose only purpose is to paint pictures—which gives an idea of what he thinks of both the machine and of art, too. Claes Oldenburg recently shaped a kapok-stuffed canvas construction simulating the air flow engine of an automobile. Then he hung it upside down from ropes, so it looks like a trussed-up cow with sparkplugs for teats.

But now something new has been added. Many artists no longer see the machine as having any special philosophical, sociological or moral implications. They're not fighting it or kidding it. They're just using it. They're creating with technological processes they often don't understand, or may even need to have engineers and physicists translate into actual objects for them, works of art that simply couldn't have existed before right now.

And some of them *are*, I think, works of art, in that whoever actually made them, only an artist could have dreamed them up. There's a marvelous piece called "Heart Beats Dust," put together by an artist, Jean Depuy, with two engineers, Ralph Martell and Harris Hyman. This one is to be found in both the Modern Museum and Brooklyn Museum shows, because that's the way it is with machine art. It can be duplicated. It's a two-foot cube of glass in which a pile of red dust—it's really powdered pigment—rests on a rubber membrane. The contraption, I'm told, includes coaxial speakers, a tape-recording of heartbeats, a gadget so one can hear one's own heartbeat instead of that on the tape, and various shutters and lenses having to do with static electricity and acoustical vibrations. What happens is that the red dust shapes and reshapes itself into strange formations like the peaks and valleys on the moon. The total effect is beautiful, mysterious, and as relevant to human life as anything can possibly be.

But that brings up another point. The new art not only involves the viewer as well as the artist. It starts in motion a narcissism beyond belief—and the psychological implications of *that*, I can't imagine. For instance, at the Brooklyn Museum, there's a plexiglass ball about a foot in diameter inside of which can be seen a lot of electrical equipment that supposed to respond to noises. I snapped m fingers, clapped my hands—and nothing hap pened at all. I was told by the engineer show ing me around that its motor had run down But then I loudly called out, "I love you, and that plastic ball rolled right across th floor to me.

The Brooklyn show is full of such pieces all entered in a competition run by an organi zation called EAT, for Experiments in Ar and Technology Inc. They move, blink, purr whirr—and at least one of them talks right back to critics. Some of the pieces are, I must say, quite bad. One of the things about a machine is that it doesn't have aesthetic judg ment. And that, I'm told, is why everything submitted was exhibited, although it *doesn't* explain why a competition was held at all.

That's really why I think artists don't have to worry about machines in the new age we're entering. They can, if they like, just use them. The mark of aesthetic merit will still be there. If they don't have much imagination, they'll probably come up with something like a work both museum shows that was made by an intricately programed computer—but remains just a conventional nude.

NEW YORK TIMES, NOV

Art Com

By GRACE GLUECK

Wheels whirring and motors purring, a pair of art-technology shows has clanked into two of the city's major art arenas, the Museum of Modern Art and the Brooklyn Museum. "The Machine as Seen at the End of the Mechanical Age," a historical show of "comments on technology by artists of the Western World," opened yesterday at the Modern. Assembled by Pontus Hultén, director of Stockholm's avant-garde Moderna Museet, it comprises 220 works by artists ranging from Leonardo da Vinci to Nam June Paik, a young Korean who electronically manipulates images on TV screens.

The Brooklyn show, titled "Some More Beginnings," opened Tuesday. It was put together by Billy Kluver, a research physicist and director of Experiments in Art and Technology, a burgeoning organization of artists and engineers. It includes 137 examples of collaborative art, hatched by artists working with engineers.

Contest Brings in Entries

In the works for two years, the Modern's show sparked the Brooklyn exhibition. To keep his retrospective "open-ended," Mr. Hultén asked Mr. Kluver's group to collaborate on a section of new technology in art. A nationwide prize competition, staged by Experiments in Art and Technology last year, brought 147 entries, 95 of them collaborative works. The three top prizewinners and six others appear in the Modern's show, while the rest make their bow in Brooklyn.

The views of artists on ...chnology, as seen in the Museum of Modern Art, range from humor (a selection of Rube Goldberg contraption cartoons) through hatred (the Surrealists) to complete affirmation.

"Vladimir Tatlin, the Russian constructivist, for example," Mr. Hultén said, "didn't see the machine as a vestige of destruction, but as an implement to build a new and better society."

Mr. Hultén was showing, in the museum's sculpture garden, a reconstruction of Mr. Tatlin's model for a huge motorized tower designed to house offices of the Russian revolutionary government.

Tinguely's Device Stars

One of the show's stars is Jean Tinguely's "Homage to New York," a black-painted mass consisting of various steel rods which cross between a dinosaur and a cotton gin. It "processes" beach balls tossed into its long, stove-pipe funnel through a set of clanking innards, then tosses them back at viewers.

Mr. Hultén's title for his show, "The Machine As Seen at the End of the Mechanical Age," points out that the mechanical machine, "an imitation of our muscles," is losing ground to electronic and chemical devices that simulate the brain and nervous systems.

Besides works of art, the Modern's show includes examples of real cars and cameras, the two machines that—Mr. Hultén feels—have most influenced our 20th century outlook.

A big hit in the show is an example of the famous Dy-

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NEW YORK TIMES, NOVEMBER 28, 1968

Art Comes Clanking From All Over Into Two Museums

By GRACE GLUECK

Wheels whirring and motors purring, a pair of art-technology shows has clanked into two of the city's major art arenas, the Museum of Modern Art and the Brooklyn Museum.

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The Brooklyn show, titled "Some More Beginnings," opened Tuesday. It was put together by Billy Kluver, a research physicist and director of Experiments in Art and Technology, a burgeoning organization of artists and engineers. It includes 137 examples of collaborative art, hatched by artists working with engineers.

Contest Brings in Entries

In the works for two years, the Modern's show sparked the Brooklyn exhibition. To keep his retrospective "open-ended," Mr. Hultén asked Mr. Kluver's group to collaborate on a section of new technology in art. A nationwide prize competition, staged by Experiments in Art and Technology last year, brought 147 entries, 95 of them collaborative works. The three top prizewinners and six others appear in the Modern's show, while the rest make their bow in Brooklyn.

The views of artists on technology, as seen in the Museum of Modern Art, range from humor (a selection of Rube Goldberg contraption cartoons) through hatred (the Surrealists) to complete affirmation.

"Vladimir Tatlin, the Russian constructivist, for example," Mr. Hultén said, "didn't see the machine as a weapon of destruction, but as an implement to build a new and better society."

Mr. Hultén was showing, in the museum's sculpture garden, a reconstruction of Mr. Tatlin's model for a huge motorized tower designed to house offices of the Russian revolutionary government.

Tinguely's Device Stars

One of the show's stars is Jean Tinguely's "Rotozaza," a black-painted steel contraption that looks like a cross between a dinosaur and a cotton gin. It "processes" beach balls tossed into its long, stove-pipe funnel through a set of clanking innards, then tosses them back at viewers.

Mr. Hultén's title for his show, "The Machine As Seen at the End of the Mechanical Age," points out that the mechanical machine, "an imitation of our muscles," is losing ground to electronic and chemical devices that simulate the brain and nervous systems.

Besides works of art, the Modern's show includes examples of real cars and cameras, the two machines that—Mr. Hulten feels—have most influenced our 20th century outlook.

A find in the show is an example of the famous Dymaxion car created by the designer R. Buckminster Fuller in 1933. All models of the streamlined, three-wheel job that can turn on a dime were thought to have been destroyed. But several months ago, a battered Dymaxion was turned up by an art student in a Tempe, Ariz., garage.

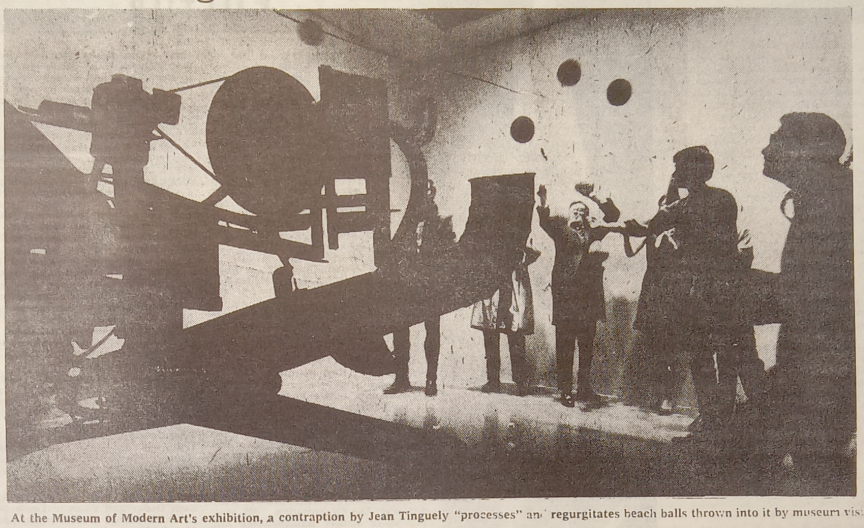
"Heart Beats Dust" and "Cybernetic Sculpture," the first and second prize-winners in the technologists' competition, are also on view at the Museum of Modern Art. The first, a collaboration between an artist, Jean Dupuy, and an engineer, Ralph Martel, is a kinetic sculpture of red dust, enclosed in a glass-faced cube and made visible by a high-intensity light beam. The dust is activated by acoustic vibrations produced by the rhythm of heartbeats.

The second prize-winner, created by Wen-Ying Tsai, the Chinese-born artist-engineer, and Frank T. Turner, consists of vibrating stainless steel rods whose visual effect is continually modulated by high-frequency strobe lights. The lights react to sound, such as a voice or a hand-clap, producing an illusion of corresponding movement in the rods.

"The Machine" catalogue, which carries out the show's theme, has already become a collector's item. Bound in tin-can steel that resembles the cover of a factory log book, it was designed by Mr. Hultén and produced in Sweden by a beer can manufacturer.

The Brooklyn Museum show, housed in a capacious gallery on the fifth floor, has been described by Mr. Kluver as "concerned with the art of participation."

"It's significant," he said, "that all of the prize-winners in the show can be reproduced. One tendency of art might be anonymity in the future."



At the Museum of Modern Art's exhibition, a contraption by Jean Tinguely "processes" and regurgitates beach balls thrown into it by museum visitors

NEWSDAY

ART IN NEW YORK

SPECTATOR PARTICIPATION

"**Pond**" by Robert Whitman (Jewish Museum, 1109 Fifth Ave.); "**Soundings**" by Robert Rauschenberg (Museum of Modern Art, 11 W. 53rd): Robert Whitman's *Pond* is an environmental work consisting of large circular and rectangular frames across which are stretched sheets of Mylar, an elastic plastic mirrorized with aluminum coating. The effect is that of separate mirrors—some of them concave—in which the public sees itself reflected and transformed by controlled electronic frequencies that cause the mirrored surfaces to vibrate. Flickering strobe lights have also been placed at the foot of each mirror to abet the distortions. In addition, single words are projected upon some of the mirrors, while a voice speaks the same words at various intervals.

Discombombulating? Not in the least. In fact, nothing could be more calm or collected. My own first reaction was a sense of floating upon the surface of variously stirred bodies of water. As I walked from mirror to mirror in the darkened room, I observed how my image became blurred, went out of focus, became clear, disappeared altogether, advanced or receded. The experience became most hypnotic and not unpleasant as the "reality" of my image—my shape and presence—was questioned.

Mercifully, the Coney Island fun-house mirror syndrome is absent from Whitman's work. He's obviously after something else. He seems to be toying with the unsubstantiality of our appearance, while confronting and tantalizing us with the fascination we have for our own image. Finally, he shows us how fugitive our image really is—how evasive and unconcrete. It's an interesting and compelling notion, made disturbingly real by Whitman's craft and imagination.

Robert Rauschenberg's *Soundings* is also concerned with frequencies and electronically stimulated efforts. It also involves our image, but this work, consisting of nine eight-foot-high mirrored units containing three layers of Plexiglas panels, does not alter our image. Instead, it is *we* who alter the work itself—by uttering sounds. We become the participants in the creation of a work of art. By merely speaking, or coughing, or humming, we transform the object. Any sound we make causes the object to light up—and when it lights up, it reveals a seemingly endless array of chairs placed at various angles. The work is thus incomplete without our participation. When no sounds are uttered we are left staring at our own image reflected in the mirrored panels.

Rauschenberg created *Soundings* in collaboration with E.A.T. (Experiments in Art and Technology), and it does produce a certain magical ambiance. Ultimately, however, the work, and its electronic effect, seems distant and remote. Somehow a curious inverse "emotional" phenomenon occurs. It is the *object* that is stirred and moved—not us. And the spectator is somehow left holding the bag.

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DER SPIEGEL, DECEMBER 1968

KULTUR

KUNST

MASCHINEN

Bälle für Rotozaza

Die Kunst", plakatierten Berliner Dadaisten schon 1920, „ist tot. Es lebe die neue Maschinenkunst Tatlins."

Das war zu früh gejubelt — die Ablösung fand noch nicht statt. Maschinenkunst, wie sie der Sowjetrusse Wladimir Tatlin, Erfinder eines mit Muskelkraft betriebenen Flugapparats, konzipierte, hat erst seit den fünfziger Jahren ein größeres Terrain gewonnen.

Nun aber rotieren, klingeln, blinken technische Ateliér-Produkte in allen wichtigen Avantgarde-Ausstellungen, und selbst durch elektronisch gesteuerte Effekte verblüffen sie neuerdings ihr Publikum. Denn mit der Maschinen-Technik ist auch die Kunst „am Ende des mechanischen Zeitalters" angekommen.

Diese Einsicht veranschaulicht der Museumschef Karl Pontus Hultén aus Stockholm jetzt gleichzeitig in zwei New Yorker Ausstellungen: Während er im Museum of Modern Art ältere Künstler-Reaktionen auf die Technik als Rückschau darbietet, sind im Brooklyn Museum „Noch mehr Neuheiten" installiert.

Die 137 Novitäten sind Beiträge zu einem Wettbewerb, der von der Gesellschaft „Experimente in Kunst und Technik" (EAT) ausgeschrieben worden war. Die Organisation, 1966 vom Pop-Vater Robert Rauschenberg mit dem Physiker Billy Klüver gegründet, versprach 3000 Dollar für das beste Werk, das nur durch Künstler und Ingenieur gemeinsam zu realisieren sei.

Den Lohn kassierten jetzt der Franzose Jean Dupuy und sein amerikanischer Techniker-Partner Ralph Martel für ihre Konstruktion „Herz schlägt Staub": einen Glaskubus, in dem eine Gummimembran entsprechend dem vom Tonband abgespielten Pochen eines menschlichen Herzens vibriert und dadurch roten Staub rhythmisch in einen Lichtkegel wirbelt. Betrachter können mittels Stethoskop auch ihren eigenen Herzschlag auf die Membran übertragen.

Andere Bewerber schickten beispielsweise zitternde Stahlstangen, die unter Lichtstäben eine Art Bauchtanz zeigen, sowie eine Plexiglas-Kugel (Titel: „Spielzeugtier"), die sich mittels akustischer und optischer Signale durch das Museum scheuchen läßt, wobei sie Knurr- und Wispertöne ausstößt — komplizierte Trick-Objekte, wie Techniker-Phantasten sie seit Jahrhunderten vergebens zu realisieren suchten.

Den Werdegang der Künstler-Utopien verfolgt Hulténs Retrospektiv-Schau, in der auch wirkliche Maschinen wie ein Bugatti-Auto zu sehen sind, weit zurück: bis zu Zeichnungen, in denen schon Leonardo da Vinci simple Fluggeräte skizziert hatte. Die frühen Projekte, Tatlins Vogel-Imitation ähnlich, wurden jetzt in New York verwirklicht.

Gleichfalls zur Ausstellung nachgebaut wurde ein Tatlin-Werk: das — zerstörte — Modell, das der Künstler 1920 für ein „Monument der Dritten Internationale" hergestellt hatte. Die Ausführung des 400 Meter hohen Metallturms, in dem zylinderförmige Räume rotieren sollten, ging freilich über die Kraft des jungen Sowjet-Rußland.

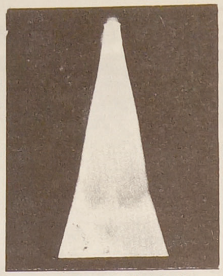
Neben und nach Tatlin erprobten auch Dada- und Bauhaus-Leute (vornehmlich Marcel Duchamp und László Moholy-Nagy) Apparate mit Kunst-Charakter, und der Mobile-Erfinder Alexander Calder führte die Entwicklung fort. Den meisten Künstlern aber war die Maschine höchstens ein symbolkräftiges Bildmotiv — so dem Franzosen Francis Picabia, der Lokomotiven-Teile als „Braut" und „Mädchen ohne Mutter" porträtierte.

Reale, wenngleich zweckfrei funktionierende Maschinen erbaut seit etwa zwei Jahrzehnten der Schweizer Jean Tinguely; er wurde damit zum Anführer der nun erst weit verbreiteten „Kinetik" (Bewegungsplastik). In New York zeigt er jetzt unter anderem ein parodistisches Gebilde („Rotozaza"), das der Kritikerin Grace Glueck wie eine „Kreuzung zwischen Dreschmaschine und Dinosaurier" erschien: ein Gerät, das mit Gummibällen gefüttert wird und dann auch Gummibälle ausstößt.

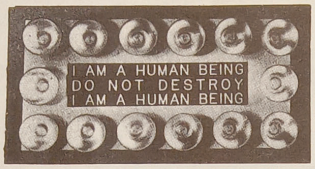
Rotozaza ist, wie fast alle Tinguely-Produkte, von alter, mechanischer Art. Die neuen, zur EAT-Konkurrenz eingereichten Konstruktionen sind technisch ungleich raffinierter.

Sie sind auch anfälliger. Schon nach drei Wochen Laufzeit war die Ausstellung im Brooklyn Museum von eifrigen Benutzern etwa zur Hälfte ruiniert. Das aber, sagt EAT-Gründer Klüver, hat auch sein Gutes.

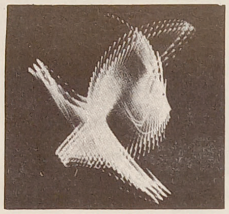
Klüver: „So merken die Künstler jedenfalls, daß ihre Sachen stabiler werden müssen."



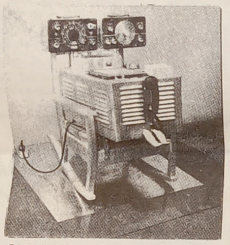
Jean Dupuy: „Herz schlägt Staub"



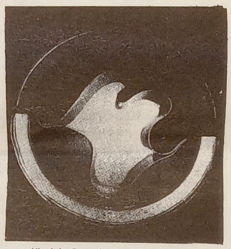
Jean Toche: „Ich bin ein menschliches Wesen"



Ben Laposky: „Elektronische Abstraktionen"



Edward Kienholz: „Freundlicher Computer"



Virginio Ferrari: „Fruchtbare Liebe"

Maschinen-Kunstwerke in New York: Mädchen ohne Mutter

DOMUS, DECEMBER 1968 EXCERPT

E.A.T., NEW-YORK: AU-DELA DE LA DISTINCTION ENTRE LE TRAVAIL ET LE LOISIR

A New-York sur des bases moins ambitieuses, Robert Rauschenberg et l'ingénieur Billy Klüver, spécialiste des lasers à la Bell Telephone Co. ont créé à la fin de l'année 1966, l'E.A.T., « Experiments in Art and Technology »: une association composée d'artistes, de savants et d'ingénieurs dont le but est l'étude systématique des possibilités nouvelles de langage offertes par la technologie contemporaine dans tous les domaines. L'E.A.T. s'est fixée pour but d'ouvrir à l'art une porte sur le monde de l'industrie et de la technique, en organisant rationnellement la rencontre entre volontaires des deux bords. Toute collaboration entre l'art et l'industrie repose sur la compréhension mutuelle. Dès sa fondation, l'E.A.T. a rencontré une audience profonde dans tous les milieux artistiques; l'initiative correspondait à un réel besoin. Du côté scientifique l'idée de cette rencontre était venue à Billy Klüver lors de la préparation avec Rauschenberg des 9 soirées de spectacles (13-23 octobre 1966) technologiques présentées dans la fameuse caserne du 69th Regiment Armory (siège de l'Armory Show en 1913). Ces 9 soirées-spectacles comportaient des spectacles de danse moderne et des « mises en situations » proches des happenings au cours desquels les spectateurs-acteurs pouvaient entendre les émissions sonores de leurs corps amplifiées et retransmises sur écran (pulsations, rythme respiratoire, battements du coeur); expérimenter les effets optiques de l'holographie (« voir sans lumière »); communiquer par ultra-sons; assister à des phénomènes mécaniques de lévitation.

L'immensité des efforts nécessaires à la mise en oeuvre d'un tel projet, incita Billy Klüver, un ingénieur électronicien d'origine suédoise et chercheur aux laboratoires Bell, à envisager la normalisation des rapports art-industrie: réunir les éléments d'une collaboration permanente et non plus exceptionnelle. Ami intime du directeur du Musée d'Art Moderne de Stockholm, Pontus Hulten, et de tous les pop-artists américains, Klüver connaissait bien leurs problèmes techniques, pour les avoir souvent aidés à les régler. Son enthousiasme auprès de ses collègues techniciens fut comunicatif. Un an à peine après sa fondation, l'E.A.T. s'était faite connaître à New-York et dans toute l'Amérique par des conférences de presse retentissantes. L'association comptait déjà parmi ses membres plus de 300 artistes et une centaine de techniciens, de chercheurs et d'ingénieurs. Grâce à l'aide de la Fédération Américaine d'Automation, elle disposait d'un siège central, « l'Automation House », un building de six étages comprenant tout un appareillage mécanique, électronique et électrique ainsi qu'ur laboratoire et des salles de conférences. Des groupes de travail réguliers se sont constitués, dans les différentes branches de la technologie: chimie du plastique (polymérisations); structures de Hexcel (nids d'abeilles); laser, holographies; procédés photo-mécaniques; techniques de télévision; programmation-électronique: son, image, langage (computer-music,-images,-poetry), techniques de génération du son; technologie du papier: surfaces absorbantes, papier dissolvants, structures et enveloppes; étude optique de la lumière et de la couleur.
Les ingénieurs et les techniciens participant à ces groupes de travail exposent aux artistes l'état d'avancement de leurs travaux dans telle ou telle branche de la technologie. Les artistes intéressés peuvent s'adresser aux techniciens et leur soumettre des idées et des projets en vue de leur réalisation pratique. L'ingénieur joue un double rôle d'informateur et de conseil. Enfin, si le projet de l'artiste dépasse par son envergure et ses dimensions les possibilités de la simple collaboration directe, l'ingénieur se transforme en impresario-producteur en s'efforçant d'obtenir les contacts et les moyens nécessaires sur une grande échelle.
Comme l'a justement souligné Billy Klüver, « l'E.A.T. est une tentative révolutionnaire qui a pour but de catalyser la responsabilité individuelle dans l'élaboration d'une technologie nouvelle... Nous sommes responsables vis à vis de la technologie qui déterminera demain notre cadre de vie. Cette responsabilité implique l'orientation de la technologie vers le jeu et le plaisir du plus grand nombre... Elle implique aussi l'abolition de toute distinction entre travail et loisir ». Dans la collaboration artiste-ingénieur, le jeu se joue à parts égales. Si l'artiste bénéficie d'un supplément d'imagination, il offre en contrepartie à l'ingénieur la possibilité d'humaniser la technique, de l'intégrer définitivement dans le processus de socialisation de l'art.
Les ambitions de l'E.A.T. ne se limitent pas aux USA: la formation de sections étrangères est prévue dans le monde entier. Des réactions en chaîne se produisent, au niveau des musées notamment, témoignant d'une évolution significative de la muséographie moderne.



Qui sopra, l'invito alle nove serate di « Theatre & Engineering » di Rauschenberg alla 69th Regiment Armory di New York, nell'ottobre 1966.

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ELECTRONIC NEWS, DECEMBER 2, 1968

ELECTRONICS MAKES IT BIG IN ART

NEW YORK.—IEEE and Wescon people would do well to hustle across the river for some fresh ideas on how to remove the feeling of deja vu from their shows next time around.

The liveliest electronics show around—possibly the liveliest show of any kind—is over there in the Brooklyn Museum, of all places. There hasn't been so much jump in Brooklyn since the Dodgers won the series there.

Called "Some More Beginnings" the show consists of 139 works organized by Experiments in Art and Technology, the organization which combines the talents of artists and engineers in the creation of art.

And if crossing the river is too vast an undertaking just for pure fun and ideas, the Museum of Modern Art in Manhattan is presenting nine recent works produced through an international competition sponsored by EAT, including the three prize winners. They are part of the museum's new exhibit called, "The Machine as Seen at the End of the Mechanical Age."

Both shows revere the machine and ridicule it as does the Swiss artist, Jean Tinguely, at the Modern Museum in his Rotozaza, a contruction which seemingly produces and destroys its own output. Or they regard it with an enveloping awe, as Robert Rauschenberg, chairman of EAT, does in his special exhibit, "Soundings."

But Brooklyn is where the action is, possibly because there's more of it and viewer participation is greatest. One enters a new environment of sounds and lights and designs where he presses buttons and things happen or fail to happen; where color is supplied not through pigments but through laser beams and where the arts of optics and acoustics take on double meanings and dimensions.

Of the prizewinners — shown in both exhibits—the first prize, "Heart Beats Dust," is most likely to keep visitors milling about. Engineers were Harris Hyman of Systems Management Corp., and Ralph Martel of Ehn Graphics, Inc., who collaborated with French artist, Jean Dupuy, in a construction of red dust on a rubber membrane enclosed in a glass cube. Acoustic vibrations pass through the membrane activating the red dust that whirls around in the rays of a tungsten-halogen lamp. During at least one demonstration, Mr. Martel rigged up a stethoscope for spectators whose own heart beats provided the rhythmic vibrations of the dust.

A mechanical version of the Indian rope trick, "Fakir in ¾ Time" is the second prize winner. The artist is Lucy J. Young and the engineer her husband, Niels O. Young, of Block Engineering, Inc. *Based on the principle of the lariat, a cord revolves at 100 mph by means of an electric motor and sheave.*

In "Cybernetic Sculpture" by artist-engineer Wen-Ying Tsai and engineer Frank T. Turner, stainless steel rods vibrating at 30 hertz are illuminated by strobe lights which are controlled by sounds picked up in the environment.

In synchronization with the lights and rods at 30 hps, the rods, in the shape of a harmonic curve, appear to be still. Variations in sound trigger the voltage-controlled oscillator change the rate of flashing. Difference between the rate of vibration and the flash rate give the illusion of motion in the rods. The graceful "dancing" of the rods probably won third prize for this sculpture.

In other displays, the play of a helium-neon laser in "Light Trivium," by David Chapin, artist, and Jacques Pankove, of RCA Laboratories, resulted in an eye-catching effect on Teflon blocks and mirrors on a sort of modified pool table.

Then, too, a sculpture in plaster of a woman, her face a cathode-ray tube which changed "expression" through sound on magnetic amplifiers, was strangely attractive and disturbing.

But picking out individual works is difficult and unrewarding. The art is to be found through participation and experimentation by the visitor.

When you press buttons and computers start operating, sounds descend. Push an electronic-packed ball over the floor and observe startling gyrations. Press your face against an air filled plastic bag and find the environment changes; crawl into an igloo and find a splatter of lights and colors; find yourself riding a conveyor belt; listen to new yet strangely familiar sounds; place your hand between mirrors and see the unexpected.

Experience Pays Off.

The exhibit is an undoubted personal triumph for Mr. Rauschenberg and Dr. Billy Kluver, president of EAT, who were responsible for a similar art-technological collaborative show presented at the New York Armory and called "Nine Evenings." That was bombed by the critics. "Some More Beginnings" is an undoubted hit.

Experiments in Art and Technology has capitalized on past mistakes. It has provided greater participation by the visitor; has received a handsome mounting from the museum. It had enough going to keep excitement high even when some of the equipment broke down during the preview and as it undoubtedly will again during the course of the showing.

Yes, IEEE exhibitors would do well to view their work and learn a few lessons. For that matter, IEEE would do well to take on EAT as a consultant in art of displaying electronics in a way that would prevent exhaustion.

One more point. The museum has a poster on which a print of "Peaceable Kingdom" a painting by an American primitive, Edward Hicks, (1780-1849), is mounted over the legend: "The Brooklyn Museum is for Everybody." "New Beginnings" may prove to be a primitive electronics show sometime in the future. But for now, it's certainly for everybody. That it is.

—NAT SNYDERMAN



PRODUCTION SPOOF: Jean Tinguely does his thing with a bizarre balance of input-output at Modern Museum. His "Rotozaza" is in the background.

TV CHAIR: This set (left) can be blocked off from the viewer's consciousness just by sitting on it. The whole thing will rock you.

HILARY HARRIS CREATION: "Arm," in collaboration with James Macaulay, a Scottish engineer, Arm has five articulated elements driven by a motor. The movement is directed through a computer program.



IT SAYS MOMMA, TOO: This assemblage of bicycle wheels, tape recorders, spotlights and battery charger, activated by sound, is the result of the partnership of artist Ralph K. Martell and Norton Wise, Auburn University.



I AM A HUMAN BEING: Do not Feld, Spondior Mutilate, pleads the creation of Jean Tuche. Structure is Plexiglas, wood and Formica. Fourteen 300-watt flood lights, operated by a motor-driven switch flash on and off.

VILLAGE VOICE, DECEMBER 5, 1968 EXCERPT

art

TO MAKE IT NEW

by John Perreault

The interface between two systems or the meeting place is where the action is. Sparks fly. Languages adapt, adopt, or merge. Interface is potentially intercourse. To make it new start all over again from new principles (Fuller, Duchamp, etc.) or force a hybrid (Luther Burbank). On the one hand—or at least on the surface—there is art and on the other hand there is technology. Bring them together and the offspring should at least be interesting, if not valuable: not art at the service of technology (i. e., "advertising"), but technology in the service of art and therefore we have a paradigm for technology and science in the service of man.

The skillful use of science and technology can be used to provide food, clothing, and shelter for everyone, and the elimination of toil (if only they would!). In cooperation with artists, science and technology can also be used to provide those secondary necessities that crop up after the primary ones are satisfied: delight and self-knowledge. These needs help distinguish us from the animals.

Certain similarities between art and technology indicate the possibility of a fruitful marriage. These similarities also clarify differences. Art and technology are both systems of translation. Technology translates pure science from the realm of abstract ideas into useful techniques and devices. Art translates experience and emotions into form. When it translates ideas, it usually translates philosophical attitudes rather than scientific concepts. Both art and technologies in their own manner translate abstractions into concrete terminologies. Although intuition plays a part in pure science and in technological discoveries the basic process is reasonable. In art, no matter how reasonable some art may seem on the surface, intuition is the main force. The still tentative marriage between art and technology therefore offers the possibility of the reasonable exploitation of intuition and the intuitional exploitation of reason.

We are in a period of transition. With one foot in the Mechanical Age and the other in the Electronic, there is always the possibility of slipping back into the dark. The Electronic Age, not yet completely assimilated, already seems to be branching off into the Bio-Chemical. Where are we going? Where have we been? These questions are inter-related. "The Machine as Seen at the End of the Mechanical Age," at the Museum of Modern Art, is a thoughtful and well-organized survey show that explores some of this territory. Technology is certainly an important theme of modern art. Here we have examples from Futurism, Dada, and Surrealism. The more recent examples are the Experiments in Art and Technology contest winners. "Heart Beats Dust" by Harris Hyman and Ralph Martle is the winner of the first prize. It is a chamber of red dust activated by amplified heartbeats. It is eerie and poetic and certainly one of the most successful of the entries, many more of which are now on display at the Brooklyn Museum: "Some More Beginnings."

Both shows offer a rich survey of attitudes towards technology: eroticism, fear, iron celebration, and playfulness. The Museum of Modern Art Show is noteable for its fine historical selection: Duchamp, Picabia, etc. "Some More Beginnings" is totally unselective, but in this instance this is a virtue for it allows us to see the confrontation between art and technology in the raw.

Our relationships with machines and electronic systems are mirror images or our relationships with ourselves. If we learn how to relate to technology (which is after all an extension of ourselves) we may yet learn how to relate harmoniously to ourselves. The reverse is also true. Someone who is in harmony with himself will not be disturbed by the feedback from his mechanical or electronic psuedo-selves or allow them to dominate. Only when the left hand knows what the right hand is doing can the object be grasped. The fear we have of technology is fear of ourselves.



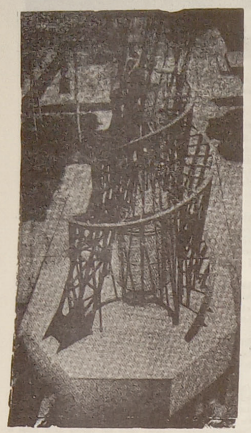
sopra, l'invito alle nove serate Theatre & Engineering» di Rauschenberg alla 69th Regiment Armory di New York, nell'ottobre 1966.

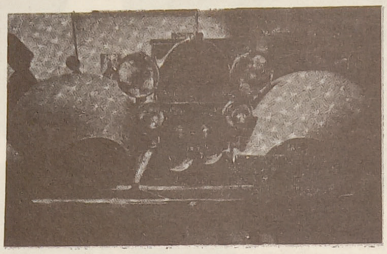
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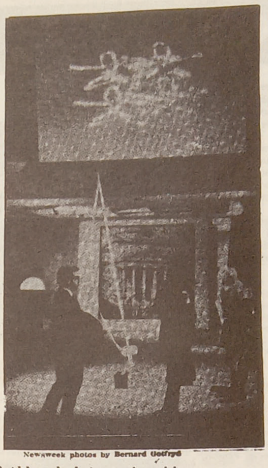
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NEWSWEEK, DECEMBER 16, 1968

ART







Tatlin's tower and the Bugatti Royale at MOMA; Brooklyn's swinging EAT exhibit with magic lariat and computer-made film in foreground: Bringing about utopia?

Newsweek photos by Bernard Gotfryd

Bleep, Blare, Rattle, Whir

New York's Museum of Modern Art and Brooklyn Museum are currently typifying the new swinging museum scene. Two related shows, "Some More Beginnings" at Brooklyn and MOMA's "The Machine as Seen as the End of the Mechanical Age," are a clangorous combination of more than 350 paints, sculptures, drawings, films, inventions, environments and thingamabobs that bleep, blare, bellow, rattle, whir, grunt and, at times, kick up a pretty big dust.

The Brooklyn show is the result of an international competition organized last year by Experiments in Art and Technology (EAT), a burgeoning organization of artists and engineers. "These are works that could never have been realized without the close collaboration of technology and art," says Billy Klüver, the former Bell Laboratories engineer who is director of EAT. "It is a good example of up-to-date technology at the service of up-to-date art."

First prize in the EAT competition was given to Frenchman Jean Dupuy and American Ralph Martel for their kinetic sculpture "Heart Beats Dust," a glass box in which blood-red dust, illuminated by a high-intensity light beam, is bounced up and down on a thin membrane by the acoustic vibrations of recorded heartbeats. The second prize winner, "Cybernetic Sculpture," created by Wen-Ying Tsai and Frank Turner, is a series of shimmering aluminum rods which, modulated by high-frequency strobe lights, produce the illusion of a floating harmonic wave. There are also a loop of tape that floats in myriad shapes through the air like a magic lariat and a film of complicated geometric shapes that was made by a computer.

The MOMA show, which includes duplicates of the Brooklyn prize winners, is a historical anthology of comments on technology by artists from Leonardo to pop artist Claes Oldenburg. "The mechanical machine has always been an extension of the human body," says K.G. Pontus Hultén, director of Stockholm's Moderna Museet, who organized the show. "But now we have machines that are not mechanical—the computers. They are mind machines—extensions of the mind and nervous system."

Early machines were not only extensions but also direct imitations of the muscle of man and animal. For centuries, brilliant inventors made automata, those Pirandellian representations of machines as living creatures: penmen who wrote and drew, artificial musicians who played organs, and ducks that seemed to eat and digest their food. Leonardo and others created ornithopters, mechanical wings that foolhardy Icarians wore on their arms and legs in an attempt to fly like the birds.

Rotating: Since the Industrial Revolution, some men have looked to machines to bring about utopia while others have feared them as the enemies of humane values. Vladimir Tatlin, the brilliant Russian constructivist who claimed he had a "machine heart," saw the machine as an implement to build a new and better society in post-revolutionary Russia. One of his efforts was a 15-foot model for a huge motorized spiraling tower that was supposed to house the revolutionary government in offices that would rotate at different speeds. Dadaist Marcel Duchamp ennobled machines to the lofty realm of art—he exhibited an ordinary bicycle wheel, painted such objects as chocolate grinders, and created numerous optical illusions with rotating motorized disks. He once said to the sculptor Brancusi: "Painting has come to an end. Who can do anything better than this propeller? Can you?"

For painter Fernand Léger, the machine represented visual clarity and precision. "Out of a thousand paintings, are two beautiful?" he asked. "Out of a hundred manufactured objects, thirty are beautiful." Although their utopian vision of the machine was superficial and sentimental, the Italian Futurists admired its speed, noise and bright finish, claiming that "a roaring motorcar is more beautiful than the Victory of Samothrace." And Ettore Bugatti, a contemporary of the Futurists, even gave up sculpture to create the Bugatti Royale, the most beautiful motorcar ever made.

Witty: Others have enthusiastically seen the human being as an erotic machine. German artist Hans Bellmer made a female doll that has ball joints which allowed it to be dismantled and reassembled in various erotic positions, and Picabia was delighted with the idea that machines have no morals, constantly hinting at the endless love life of nuts, bolts and screws in his elegant and witty paintings. Jean Tinguely recently created a behemoth of motors, pulleys and stovepipes that throws rubber balls at viewers, who take great delight in throwing them back.

Contemporary artists have something of a love-hate relationship with machines. During the Depression, while Aldous Huxley was writing "Brave New World," in which babies were made in fetus factories, and Hollywood was turning out mad-scientist movies, Alexander Calder, as the MOMA show demonstrates, was rejecting motorized mobiles in favor of sculpture which danced on air and Rube Goldberg was satirizing in his madly witty cartoons the human infatuation with absurdly complicated mechanical processes. Since the explosion of the atomic bomb, man has once again begun to question the relationship between rationality and technology. "The great horror of this era," says Hultén, "is the tendency to think that technology develops independently of human will. All mankind must follow the example of the artist and take responsibility for his acts."

—DAVID L. SHIREY

CHEMICAL ENGINEERING, DECEMBER 16, 1968: EXCERPT

Art Shows Display Works By Engineer-Artists Teams

Dust activated by acoustic vibrations, a mechanical Indian rope-trick, and a cybernetic sculpture are the three top winners in an Experiments in Art and Technology, Inc. (E.A.T.) sponsored contest that required the collaboration of artists and engineers (*Chem. Eng.*, Feb. 26, pp. 102-4). The winning works were selected from more than 150 entries by a jury of five scientists and engineers. The jurors based their judgments on the inventive and imaginative use of technology, and the extent of interaction between engineer and artist.

The $3,000 first prize was awarded to Harris Hyman (a systems consultant, Systems Management Corp.) and Ralph Martel (EHN Graphics, Inc.), who worked with artist Jean Dupuy to construct a sculpture entitled "Heart Beats Dust." In the work, red dust (lithol rubine) lying on a stretched rubber membrane enclosed in a glass cube is thrust upward by acoustic vibrations that simulate the rhythm of heartbeats. A high-intensity beam of light illuminates the activated dust particles.

Physicist Niels O. Young, vice president of Block Engineering, Inc., and his artist-wife, Lucy Jackson Young, received a $1,000 second prize for their "Fakir in ¾ Time," a mechanized Indian rope-trick. It uses the principle that motion of a cord along its own length causes it to become rigid. The cord in "Fakir"—a large loop of textile tape—is retracted and released upwards by means of an electric-motor-operated pulley at the rate of 100 mph., giving a fountainlike appearance.

"Cybernetic Sculpture," created by artist Wen-Ying Tsai and Frank T. Turner, an engineer with Western Union Telegraph Co., was also awarded $1,000 by tying for second place. This sculpture uses the principle of a standard wave of harmonic motion as produced by a vibrating rod. It consists of several stainless-steel rods that are more than nine feet high and are 20 in. dia. at the base. As the rods vibrate at 30 cycles/sec., they are illuminated by high-frequency stroboscopic lights. The difference between the vibration frequency and flash rate gives an illusion of motion to the rods. The greater the deviation between the two frequencies, the greater the apparent motion. Moreover, any sound, such as that of a voice or the clapping of hands, will register on the strobe-light's voltage-controller trigger oscillator and produces a change in the rate of flash, making it appear that the rods are responding directly to the noise.

Nine entries from the E.A.T. competition, including the three winners, are currently part of an exhibit at the Museum of Modern Art in New York City. Entitled "The Machine as Seen at the End of the Mechanical Age," the show will be open until Feb. 9, 1969. It will then move to the University of St. Thomas, Houston, Tex. (March 25-May 18), and on to the San Francisco Museum of Art (June 23-Aug. 24).

"Some More Beginnings," a showing of 128 other works from the E.A.T. contest, will be at the Brooklyn Museum, Brooklyn, N.Y., until Jan. 5, 1969.

EVO, DECEMBER 13, 1968

art

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he is a wiremesh-mens on the floor of
the car; one hears Beercans in a wooden
box . . . more Beercans in a woodern
pop-extravaganza. Ray Parkner's Boot
Hill Express, a hearse, a remodeled
horse-drawn vehicle, adorned inside not
with a corpse but with a white metal
assemblage of a Chrysler Street-Rennt
engine . . . headlights and tail lights,
are kerosene-burning lanterns from
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In

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art

PICARD

art

Tow shows organized by the Museum of Modern Art and EAT (Experiments in Art and Technology) came to the Beginning of the Beginning. The show in Brooklyn, 137 works, and nine more which are also simultaneously exhibited in Moma is called: "Some More Beginnings", 200 works—Exhibition on 11 West 53rd Street has the extraordinary Marat/Sade-Peter Weiss Title: "The Machine—as seen at the end of the Mechanical Age." The Brooklyn show lasts until January 5th. The one in the Museum of Modern Art will end February 9th, 1969, will proceed to the University of St. Thomas Houston, Texas (March 25 through May 18) and from June to August to the San Francisco Museum of Art.

Two shows, 350 works, a real double feature. A lot for the money . . . lots of Technology and lots of Art. All the old time Art from Picabia to Schwitters, to Gabo, Laszlo, Moholy-Nagy, Calder, Leger, Futurists, Surrealists, Dadaists, Bauhaus-artists, all the many Tinguely Machines, the rusty Stankiewicz-robots, Matta, Toulouse Lautrec, Takis, Duchamp K.G. Pontus Hulten, Director of the Modern Museet, Stockholm, has gotten them together for the Machine-Apotheosis at the end . . . of the mechanical age. Attending the Grand Opening, where one couldn't move and could barely see the machines working and acting—*so many machines—crazy people came to see the End of the Mechanical Age and the Beginnings of the Cybernetic one, one felt, that the end and the beginning* are quite gay.

The real Machines behave fine in the Museum meeting the human machine—orgy of holding on to each other in a *kind of wild* despair . . . at the end of the mechanical age. In Brooklyn one did a completely different kind of "Fun-Show." I will come to this later.

First let me describe the Five Automobiles which really are the best examples of Motorized Art, the Moma show can boast of. Star No. 1: "la Royale" by Ettore Bugatti (1929), a perfection piece of Technological Art work, lent by the Henry Ford Museum . . . called by pontus Hulton in the 216 page catalogue "the culmination of the heroic period of the automobile."

Bulgatti, born 1881, had been a painter, became the artist who created cars, beautiful, perfect masterpieces.

the white and silver shining "Royale" is standing in the window of the Museum and is the No. A one attraction for the elder and youngest generation, loving motorized objects. Buckminster Fuller, born 1895, has created 1933 the "Dymaxion". A strange black-gray half destroyed monster which had been found discarded in a shed by a student from Arizona State University. Fuller had built three Dymaxion cars, the one on display is Dymaxion No. 2 . . . a work of Destruction Art.

Vertically suspended is a Racing car, appearing as an Art-Object-Relief. It's the McLaren B. R. M., a colorful beauty . . .

Sitting on Nam June Paik's small plexiglass T.V. chair, one has a very good view into Edward Kienholz tiny blue sprayed "Black Seat Dodge", which has the Number 692 and is surrounded with empty Beer bottles. On the back seat of this typical Teenage-weekend-Baby are two figures making love . . . she holds a beer can in her plastic hand, he is a wiremesh-mess; on the floor of the car are more Beercans in a wooden box . . . one hears faint radio music . . .

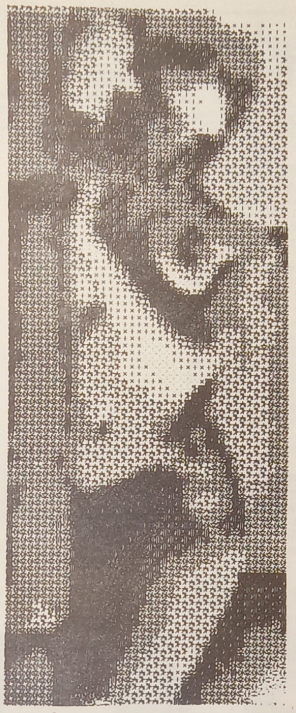
Finally at the entrance stands the pop-extravaganza: Ray Farhner's Boot Hill Express, a hearse, a remodeled horse-drawn vehicle, adorned inside not with a corpse but with a white metal assemblage of a Chrysler Street-Hemi engine . . . headlights and tail lights are kerosene-burning lanterns from India . . .

In the years from 1920 to 1930 most of the inventions in modern Art had been made, and many examples by Artists like the Twittering Machine of Paul Klee, the constructions by the Russian artists Vladimir Tatlin, Kasimir Malevich, El Lissitzky, the prophetic works by Moholy-Nagy are now in one show assembled to give an insight on how keen the mnd of these artists of our century worked in relation to the mechanical "happenings, the technological structure of the present . . . and one feels that the technological structure of the present . . . and the young artists of today basically do not much more than what had been created 50 years ago. With one exception: Computer-Art, Cybernetics and electronics used as Artmaterial are definitely "Today". We are, as one young sculptor once told me, the primitives of the Cybernetic Age . . .

In the Brooklyn Show "Some more Beginnings," the Computer, the electronic components, the Photocells, the Stroblights work overtime. So much so, that at the artists' opening night one elegant, fragile glass piece, a high rising column, filled with a flame, designed by artists-engineer team Edward Franklin and John Brooks shattered into thousand tiny glass fragments . . . as a kind of offering to the Art and Technology Gods. Claes Oldenburg spoke the tipsy toast to the start of "Beginnings", calling the affair a wedding between Engineering and Art . . . Also as a good omen one can take the birth of a baby-girl "Lumiere" to Jackie Cassen and Rudi Stern, who had for the Occasion built a kind of whispering, musical, milar-stroblighted silvery shining round pavillion—Boudoir, called "Sound-Mobile". (Engineer Edwin Hodder.) One has to get into the new poetry of words to participate mentally in the sound of things as: Photo-electric cells, Plexiglas, Sound Amplification System, Projection and Strobescopic units, Flashlights . . . and I go on from the computer-design printed "Beginnings" catalogue to quote some lines, which sound to me like op-Poetry:

"By Kasoundra, American, born 1945. Astrological Clock. Electric Clock Mechanism . . . The Face of Clock elaborates Details of Astrology this clock can be read as 5 minutes to 4 or 5 minutes to cancer . . ."

One walks hypnotized into Drop City-Ultimate fainting turning turning black light surrounded Hippietent, one is blinded by the ultra-aggressive message by Jean Toche (Belgian Artist) who shouts out in anguish facing the life and the times he lives in,—with many thousands of Volts electrical, dangerously blindingly destroying The Message: "I AM A HUMAN BEING—DO NOT DESTROY." and one is consoled and amused and falls in love with the tiny creature "TOY-PET PLEXI-BALL" by Robin Parkinson (artist) and Eric Martin (student of architecture.) This adorable little Plexiglas Baby responds, as most all the instruments of electronic Art do, to stamping one's feet or clapping one's hands.—It rolls around slowly, happily just like a toy, in fact it behaves exactly like the baby-doll one watches on T.V. "Crawling baby." But it is an abstract doll, a twenty-one century doll, a science fiction doll and I think the show in Brooklyn, brainchild Billy Kluever and Bo Rauschenberg and many others, who helped the birth of EAT along, can not be judged with the criterium of old-timeart, but must be looked at, as one looks at a Stanley Kubrick Film, Barbarella, Head, science fiction, and I mean "Science", and I mean "Fiction". I want to say, one should judge this art work in a new way, with an open mind for a future imagination, a future kind of phantasy, a future type of ART-MAKING. The old type is very well preserved in the Museum of Modern Art . . . and the catalogue is a work of Art by Pontus Hulton, in fact it is a masterpiece for the Price $6.95. Bound in Beer-cantin, all indestructible cover in colors, after a Photo of the Museums facade by Curator Alicia Legg. It's a collectors item and absolutely worthy to be put into a plexiglas box by Kulicke.



The six Price winners of the Moma-Brooklyn show and competition of Experiments in Art and Technology are: Jean Dupis, French, b. 1925 (artist) Ralph Martel, American b. 1935 Engineer, Harris Yman, American, b. 1936 Engineer.

The No. 1 work is named: HEART BEATS DUST. It is a poetic beautifully working Heart-machine, which gives out the taped heartbeat of a human being, and makes it visual through a conically shaped red pigmented dust column. The essential material is dust, the dust used is Lithel Rubine, a brilliant red pigment of low specific gravity, chosen for its ability to remain suspended in air for a long period. The Dust jumps on the bottom of the Rectangular Box regularly appearing like the eruption of a volcano, or like a moonscape with geysers sputing red dust. Price given $3,000 to the engineers.

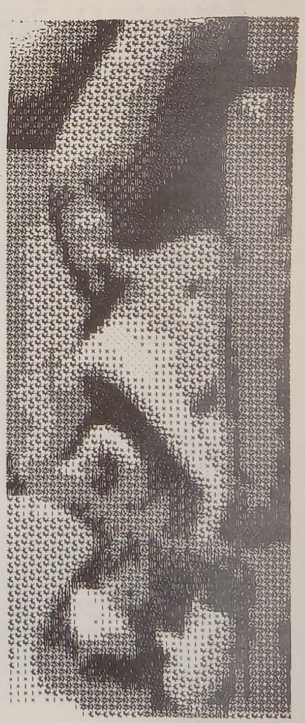
Price No. 2 went to the engineer of artist Wen-Ying Tsai, born in China, 1928, Frank T. Turner, American b. 1911. Name of York: Cybernetic Sculpture. It is made from multiple stainless steel units and dances like a Belly-dancer when turned on by oscillators, stroboscopic lights and electronic equipment. Tsai is a very inventive young artist, who has a sense for the aesthetics of mobile steel rods, which he animates to a dance in space. He has a smaller work now in an exhibition at the Howard Wise Gallery, to which he belongs as an artist and shows there regularly. His smaller piece at Wise's "Fun-on 57th Street-Show" reacts and responds to the clapping of hands immediately. The rectangularly arranged thin tubes of steel do an oriental dance of the most sensual rhythm. Go and look at this (not at all funny, but very attractive) holiday show at the Howard Wise Gallery, 50 W. 57th Street. Here Art and Technology meet in happy pleasing cooperation. Also the exhibited Bubble-Bath is a new Art-possibility. . . something for young and slender beings to crawl into and become part of a plastic Bubble. And in Agams empty room one can rest in "Peace"; it is an electronically turned on room for mental concentration, and philosophically it does the same as the Hippie-Drop City Tent in the Brooklyn Show.

Second given Second Prize was presented to Lucy J. Young (Artist) b. 1929, American and to her Husband Engineer Niels O. Young (Physicist, Vice President of Block Engineering, Inc.) Name of the piece: Fakir in 3/4 time.

The wife had the idea for a moving ribbon in Space, the husband designed the Motor-machine, — it's a much more complicated procedure, than what I have just described — to make the ribbon rise to great heights and perform beautiful arabesques in space. It's in a way like writing in air, with a ribbon-line Both second Prize winners received each $1,000.

In EAT News from March 1968 one can find the Motto or Leitmotiv for the show of the "NEWART": "E.A.T. is concerned with the Process of making art and not with the work of art as final product."

After having watched the many examples of Art-Machines, and motorized objects doing what comes naturally, moving and making sounds being turned on, or plucked in, and having been hypnotized by Marcel Duchamp's fascinating spiral record-plates whirling around and having paid a dollar for a genuine Jean Tingue (unsigned) done by Matamatic No. 8, and also been atracted by a TV Sculpture (in Brooklyn) women/and a poetic shoeshine machine, called "Life" by a young Swedish artist Per Olof Ultvedt, (in Moma) noticing in the Moma also that since Leonard da Vinci, the School of Durer, and in the 15th, 16th, 17th, 18th century many artists were compulsively under the spell of Machine-Art machine preoccuation, finally got really completely convinced that the DADA-ists had been right with their prophesy of 1920: "ART IS DEAD — LONG LIVE TATLINS NEW MACHINE ART." One reads this slogan on the large photo-mural, which is exhibited facing the work of the Russian constructivist Vladimir Tatlin. His Monument to the third Internationale is reconstructed and exhibited in the sculpture garden of the Museum. On the Photo-Mural taken from the DaDaist Catalogue of the Berlin Show 1920, the young George Grosz and John Heartfield are holding up the sign. It is a manifesto of "Political Art." Is old-Art "again condemned to a new death?" I think so! Very few people like to see something that is Ultra New and Imperfect. Most art critics are, will be and always have been AGAINST everything they cannot read easily. They are mostly blind and stuck in the mud of tradition. For them the NEWART is dead, for me the NEWART lives, has started with SOME Beginnings.



of the Mechanical Age," the show will be open until Feb. 9, 1969. It will then move to the University of St. Thomas, Houston, Tex. (March 25-May 18), and on to the San Francisco Museum of Art (June 23-Aug. 24).

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THE SUN, BALTIMORE, JANUARY 12, 1969

Art Notes

Thinkers Reject Individualism

By BARBARA GOLD

FOR the first time in 135 years, art became a special symposium subject at the annual meeting of the American Association for the Advancement of Science.

In Dallas, Dr. Billy Kluver, president of Experiments in Art and Technology, the New York-based group trying to encourage artists and engineers to work together, organized "Art and Science: Will There Be a Difference?" Six panelists, four scientists and two artists, talked about the challenges each area of endeavor faces.

These challenges go far beyond using electronic knowledge to create a light and sound environment or mechanical trickery to make a construction move. They involve basic attitudes toward creativity, social responsibility, and the existing order. Radical criticism of the way both art and science are organized underlay almost every word of the discussion.

Pessimism Noted

On the part of the scientists this criticism reflected a general pessimism that weighted earlier meetings on national science policy, the human environment, space, and technology:

Dr. Elsa Garmire, a California Institute of Technology physicist on the panel, summed up that prevailing mood, "Science may not be the ultimate answer as so many have assumed. A scientist tends to put boundary conditions on his studies, to limit his problems until he can analyze and understand them. He needs a more expansive view and maybe the artist can give it to him. Artists want to do things scientists might consider absurd—like rolling a ball."

Dr. Jack Nolan, leader of a Computer Systems Group at the Massachusetts Institute of Technology, saw the "Artist almost in the role of a critical parameter of the system, a representative of points of view difficult to accommodate in our highly organized society."

Impatience Cited

Dr. Gyorgy Kepes, director of the Center for Advanced Visual Studies at M.I.T., talked about the "incredibly menacing ecological blinders" worn by the entire society. "We will have to find some self-correcting mechanism," he asserted, "and artists have the feelers to help us do this. The artist will learn the tools to operate on a new scale of involvement. He will create a new civic art."

On the part of the artists the criticism of art and science reflected impatience that neither field seemed willing to accept the new life style the artists believe necessary for creation in our society:

Mel Bochner, now working on a co-operative artist-and-engineer project at Singer Corporation in New Jersey, explained this need in the form of a historical contrast. He no longer considers the stress on individual achievement and specialized roles that has dominated life since the renaissance of classical humanism in the Sixteenth Century relevant to modern society.

A new kind of life demands a different approach. The world has changed. Technology is no longer merely a tool.

'Something Different'

Artist Robert Whitman, whose "Pool" environment at New York's Jewish Museum is a large scale demonstration of what artist and electronic technician can do together, explained, "I don't think you can determine to do a project using a laser. It's just become part of your world.

"Something must emerge different from what each of us could do alone. It's hard to think of myself as an artist anymore. It's not interesting in the way it used to be. The most interesting thing that's happened in months is the moon thing.

"The scale of involvement required is too great to let anybody function in the world alone. I don't think anybody can do it as an individual."

Comments like this almost inevitably elicited fears from the audience about "art by committee" and about the inferior work that so often results when no one person has to take full responsibility for a project. Neither Mr. Whitman nor Mr. Bochner seemed overly concerned. Both stressed that something wholly new could emerge from genuine co-operation.

Specifics Ignored

Mr. Whitman even laughed that the only loss he really felt when he got involved in co-operative work was in the size of his own ego, and he didn't really consider that such a depressing development.

The questioners might have understood better what could result from the new kind of effort if they had been able to talk in terms of particular works of art. A movie, slide, and electronic music presentation was given at the beginning of the symposium, but this was all most of the listeners really had to go on. The discussion never got down to specifics.

Perhaps it was better that way. The significance of the new art lies as much in its philosophical basis as in the elements that compose it. Creating environments that lift the viewer out of himself and force him to experience things in an unaccustomed way necessitates a commitment to today's conditions that few of us will make to the same extent.

Silent Fury

We resist losing control of ourselves even briefly, find it difficult to do so deliberately. Works like Mr. Whitman's require that we do just that. The submission they demand symbolizes the loss of control forced on us by everyday brushes with the electronic age.

Dr. Jack Nolan, a panelist, mentioned his normally silent fury at needing a computer card to make a bank deposit, and his example is only one in the average citizen's personal list of similar brushes.

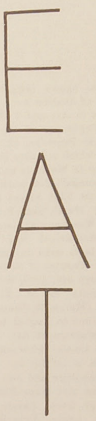
Both artists and scientists on the panel insisted that we recognize, understand, and possibly even protest against the manipulations the modern system so subtly works on us. Doing these things doesn't necessarily mean rejecting the new technology.

After all, it's here to stay. Doing them does mean facing the readjustments and untried avenues of human development the new technology makes possible.

FASHIONWEEK, JANUARY 27, 1969

AWARE

Reports that technological art is dying away are slightly exaggerated. It's still alive and kicking and even getting national. The group that organized it all and made it so "de rigeur" in the first place **E.A.T.** (which isn't supposed to be funny but is and stands for Experiments in Art & Technology) moved West this week meeting with a group of Los Angeles engineers and artists at **Doug Christmas** Ace Gallery (under **The Factory**). On hand: **Wilhelm J. Kluver**, formerly with Bell Telephone Labs. and E.A.T. president and New York artist **Wilaby Sharp**. It's still the same old story, getting those technocrats out of their "think tanks" and those artists out of their "who knows what" and getting them together, but the fascination of our time with technology and new forms has hardly ever had a better spokesman than Sharp. In a series of spontaneous happenings he played tapes of British-voiced scientists discussing technology, kinetic movies full of penumetic forms and machine art and ended up with a slide program which featured some of the new forms: inflatable, helium filled sculptures, trees programmed in water, ice sculpture, light sensitive objects, foam forms, and earth sculpture (in which the artist simply places his forms in nature, like wooden sculptures planted in meadows)



SAN FRANCISCO CHRON

Art an

By David Perlman
Science Correspondent

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ENGINEERS

Interest is running high
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their experiment.

Among them are Dr. John
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and sculptor.

The organization is now
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SAN FRANCISCO CHRONICLE, JANUARY 31, 1969

Art and Technology Get Together

By David Perlman
Science Correspondent

How many scientists and engineers dig the world of art—or realize the impact their own technology can have on artistic creativity?

This intriguing question is being answered in the Bay Area right now by a western extension of a concept that has already stirred up a storm in New York's centers of science, industry and the arts.

The concept is called Experiments in Art and Technology; it has enlisted some eminent figures in traditionally disparate worlds, and some funds from mighty technological corporations.

Now it is spreading westward, under the stimulus of two local enthusiasts: John Almen, an electronics systems engineer with Ampex Corporation, and Merlin Stone, a sculptor who teaches at the University of California and the California College of Arts and Crafts.

ENGINEERS

Interest is running high among local artists, and the ambassadors of art and technology have also recruited a number of scientific types for their experiment.

Among them are Dr. John Whinnery and Dr. Jaques Pankove, UC electrical engineers; Dr. Dominick Cagliostro, a chemist at the Space Agency's Ames Research Center; Joel Forman, president of Computer Dynamics Corp., and Dr. John Rosenbaum, a Berkeley physicist and sculptor.

The organization is now holding open house meetings every Saturday from 1 to 5 p.m. at the California College of Arts and Crafts, Broadway and College avenue, in Oakland, where scientists, engineers and artists can meet to work out ways of helping each other and explore each other's worlds.

Does a painter seek a new way of projecting images in three dimensions? A laser scientist might well introduce the artist to the new technological field of holography, where latent images emerge through sophisticated advances in optics.

Does a sculptor want new materials to develop new solid forms? A polymer chemist can explain the machinery for producing new types of extruded plastics, and perhaps take the artist on a trip through his plant.

Does a computer engineer want to experiment with new departures in programming? He may find an innovative musician eager to work jointly on an electronic concerto, and an acoustical specialist able to design new instruments to play the production.

EVENTS

In New York the national Experiment in Art and Technology is led by Dr. Billy Kluver, a physicist at Bell Laboratories, and Robert Rauschenberg, one of the world's leading avant-garde artists.

It has staged a series of artistic events called "Nine Evenings" in which science merged with the graphic, plastic and performing arts to attract critical acclaim and controversy.

It has also won the financial backing of such varied organizations as American Telephone & Telegraph Co., International Business Machines Corp., the New York State Council on the Arts, and the AFL-CIO.

AIMS

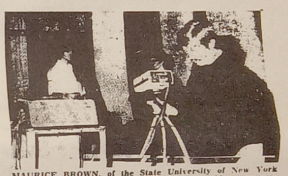
Here in the Bay Area, according to Almen, the new group hopes to attract more scientists, engineers and artists to its weekly "interface" meetings, and to plan for a varied series of public events including exhibits and multi-media performances.

The local group is beginning modestly, but hopes to play a significant role in exploiting advanced technologies to develop new art forms and new insights into creativity. Almen says. Headquarters for the local organization is at 1635 Josephine street, Berkeley, phone 843-1373.

THE KINGSTON DAILY FREEMAN, FEBRUARY 1, 1969

E.A.T.

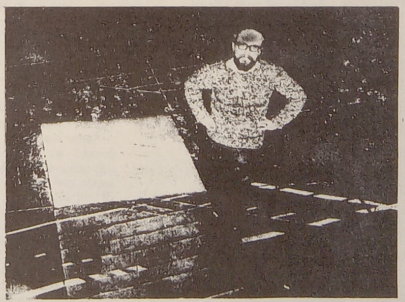
Cogs, Gears, Transistors and Art



MAURICE BROWN, of the State University of New York at New Paltz faculty, experiments with the video tape machine at E.A.T.'s second meeting on his campus, a session which drew some 40 artists and engineers to a gathering aimed at promoting the marriage of art and technology.



DISCUSSING PLASTICS and their application to mechanized gadgets and art at a recent E.A.T. meeting in New Paltz were (l) sculptress Mabelen Jones Aderma, of New York City's Cooper Union faculty, and (c) Tom Murphy, area engineer of Rhinebeck.
(Freeman photos by R. R. Haines)



STANDING ON A SYSTEMATIC PAINTING is artist and film maker Bob Liikala, of Group 212 in Saugerties, who has provided most of the organizational ability for the formation of an E.A.T. chapter in this area.

The marriage of art and technology has only recently moved out of the honeymoon stage and begun to produce bouncingly beautiful babies and lively offspring in burgeoning numbers. It took many centuries for artists to overcome their distrust of the machine—and for engineers to see how their cogs, gears, transistors and mechanized gadgets could be utilized for art.

Today many artists are enamored of the machine and many engineers and technologists are awed and inspired by art. Such a meeting of the minds has come under one roof with the organization of a group called Experiments in Art and Technology (E.A.T.) and this area is fortunate in having a newly formed chapter to coordinate the experiments in both fields and to collaborate on "hybrid art" programs and events for the enjoyment of all.

That art and technological machines have lives of their own has always been self-evident, but the myriad ways in which they can be used to create mysterious beauty and interaction has only come to the fore. Computers now paint pictures and art greats lecture and discuss the power of the brush and easel on TV.

Looking For More

The local E.A.T. group has already attracted some 40 artists and engineers to two recent meetings. The artists have come from all over the area and the engineers have represented at least six local industries. Still, organizer Bob Liikala, is anxious to have more engineers and technicians participate in the undertaking, as well as other interested personnel from local industry.

If E.A.T. combines kinetic art and moving sculptures with electronic marvels and new machines, it is also essentially a coordinating organization for artists and engineers who would like to expand their awareness of each other's areas, and collaborate on art programs and events when it seems appropriate. E.A.T. hopes to conduct many of its ventures in this area in the studios of artists and inside industrial plants. The most recent meeting was held at the New Paltz Art Gallery but the group will be moving out from there in the months ahead.

Artists and Engineers

Those interested in attending the next meeting, to be announced shortly, should contact: Robert Liikala, Box x, SUB, State University of New York, New Paltz.

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THE SUNDAY OREGONIAN, FEBRUARY 9, 1969

New Yorker Reports On Recent Developments In 'EAT' Group

By BETH FAGAN
Staff Writer, The Oregonian

Julie Martin of New York revealed recent developments of EAT (Experiments in Art and Technology Inc.) during a recent visit in Portland.

EAT, as many know, is the non-profit organization, now international in scope, whose complex purpose, simply stated, is "to assist and catalyze the inevitable cooperation of industry, labor, technology and the arts."

It was originated in 1967 by artist Robert Rauschenberg and scientist Dr. Billy Kluver (formerly with Bell Laboratories and now EAT president.) The Northwest group was formed by people of Oregon and Washington last June.

Julie Martin, who has been with EAT since its beginnings, came to Portland and went on to Seattle after visiting involved people in San Francisco and Los Angeles with Kluver.

Kluver went on to Japan in connection with a project EAT is helping administer: collaboration of four people (including David Tudor) on an environmental situation to involve sound, space and light which is scheduled for a 1970 World's Fair Pavilion in Osaka.

Of some 30 places in the U.S. where there are EAT representatives and loosely-structured groups, Miss Martin said Portland and Seattle are among the most active.

She also reported especially lively activity in Canada and "tremendous interest" in Los Angeles, especially among younger people.

It is younger people generally, she emphasized, who are most interested in the "give and take" between people of art, science, technology and industry to the mutual advantage of all and to society.

All have something to offer each other, she emphasized. And the potential humanizing role of artists for technology is not the least.

To open up avenues for communication and collaborations between scientists, engineers, other specialists of industry and people in the arts, publications are considered vital.

Publications New

Instead of the EAT Newsletter, Miss Martin reported they now are going into two publications: (1) "EAT Operations and Information," and (2) "Techne," a tab-size newspaper she likens to "The Village Voice."

Both will be available gratis to artists, scientists and engineers who are (or want to be) participants in EAT. Membership forms for participants are supplied in the first issue of "EAT Operations and Information."

Non-participating memberships at $10, $100 or $1,000 annually also are available to those who want to be kept informed and those who want to support EAT services. Non-participating members also receive both publications.

Inquiries concerning all may be directed to EAT, 9 E. 16th St., New York, New York 10003.

Miss Martin said "Techne" will be a "projects and processes" paper to include reports on collaborations, physical processes of getting things done, and possible publications of projects artists want to do.

She said they also intend asking local chapters to do entire issues. "We'd like to have chapters make them up to 'camera-ready', for publication in New York."

The other publication, "EAT Operations and Information," includes in the recently-published first issue a list of 83 technical fields and terms. Scientists and engineers are asked to designate which ones they would be interested in for collaborative work with artists.

Also included (as it will be in future issues) is a section on the safety program EAT is initiating to provide advisory service to artists, engineers, scientists, museums and art galleries.

Safety Program Started

Safety research and consultation, Miss Martin said, is becoming an important aspect of all EAT services, which she described as three-fold:

(1) Direct services to artists — "matching" them for technical aid with engineers and scientists; trying to find industrial sponsorship for projects.

(2) Adminstration, including publications and research on how to bring about a more realistic understanding and working relationship between the artist and industry.

(3) Large-scale projects, such as EAT's very recent involvement with two exhibitions: "The Machine as Seen at the End of the Mechanical Age" at Museum of Modern Art and "Some More Beginnings — Works by Artists and Engineers Involving Technology" at Brooklyn Museum.

Pontus Hulten, director of Moderna Museet in Stockholm who directed the Museum of Modern Art show had asked EAT's aid in enlarging that show with something of a postscript addition on contemporary use of technology.

Works were secured through a competition, with scientists and engineers judging entries "for the most inventive use of new technology" in collaborative efforts between engineers and artists.

Entries could be initiated by either artist or engineer, awards went to the engineers.

Hulten selected nine works for the Museum of Modern Art Show, including the three given awards, and the volume of work submitted for the competition proved so exciting and lively that another show of all 160 entries was organized under the title "Some More Beginnings" for the Brooklyn Museum. Both shows ran simultaneously, and a catalog was published for each.

Miss Martin said public response to the Brooklyn show was phenomenal, especially among young people, who, it was discovered, were even playing hooky so they could visit the exhibition time and again.

Miss Martin remarked with a smile that one estimate has been made that it will take 30 years for industry to effect any policy change which would permit artists to work with industry on a realistic basis — with appreciation for the artist's role, just as there now is appreciation for the role of scientist or engineer.

She said EAT's approach to industry now is on three levels.

"The most successful has been in terms of individual engineers and scientists collaborating with artists "after hours" instead of 'on the job.'"

"The second approach has been through foremen, directors of research, etc. — people with access to materials, equipments, processes — and progress has been made in this area.

"The third has been to presidents and boards of industry. They are enthusiastic, but not yet willing to make policy changes. Some artist-in-resident programs have been established, and some which are more research-oriented have had artists on the payroll: Bell Laboratories, for example, and Singer Corporation which has had an artist doing research on computer analysis of color.

"Increasingly," she added, "there are also programs of artists going into industry on a limited, one-shot basis.

"One of the best examples — also an example of the fact that museums and other educational institutions are beginning to take initiative and play active roles — is in Los Angeles.

Through Maurice Tuchman of Los Angeles County Museum of Art, a number of artists are being placed in a number of industries, and what comes of the collaboration will compose an exhibition at the museum in 1970.

Miss Martin also reported that the Museum of Modern Art Show "The Machine as Seen at the End of the Mechanical Age," which includes the juried, collaborative works using new technology is going on to San Francisco as well as Houston.

Her involvement with EAT dates back to having helped out with "Nine Evenings" at the New York Armory — EAT's forerunner.

That was while she was a graduate student at Columbia University. After completing her master's degree on Russia, she said she was "bumming around," and eventually landed up with newly-organized EAT.

EAT's national board of directors, chairmanned by Robert Rauschenberg, include Prof. Gyorgy Kepes, director of the Center for Advanced Visual Studies at Massachusetts Institute of Technology, composer John Cage, Dr. Pontus Hulten, R. Buckminster Fuller, Alfred Barr, and others in science and industry.



JACK FYERLY, Portland EAT coordinator, and Julie Martin, New York, who has been with EAT since its beginning. She was on West Coast tour.

NEW YORK TIMES, FEBRUARY 16, 1969 EXCERPT

Fun and Games With Space

By GRACE GLUECK

Using space not for principle but poetic effect, a young Japanese artist named Keiji Usami has set up a laser beam environment at the Jewish Museum, 92nd Street and Fifth Avenue. After some bothersome business with the Department of Health, he has finally won approval for display of "Laser: Beam: Joint," consisting of five acrylic panels and two laser beams (red and green).

The beams, originating from two points behind a screen, are bounced from one panel (each bearing a cut-out of two human figures) to another, by means of tiny, strategically-placed mirrors. The bounced beams not only set up a spatial relationship among the cut-out figures, but "activate" the void between with a network of red and green light lines.

It was Usami's intention to have viewers further "structure" the space by interacting bodily with the beams (when you step in front of one, you stop it cold). But the Health Department has refused permission and the work must be viewed from behind a glass partition.

Seen that way it can be looked at as a fascinating educational display of laser beam properties—and a sort of updating, in terms of materials, of the kind of "drawing in space" familiar to us in Cubist and Constructivist sculpture. But, incompletely realized as it is, it fails to transcend (alas!) an unfortunate resemblance to those anatomical diagrams you are apt to see in museums of science and industry.

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EAT' Group

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EYERLY, Portland EAT coordinator, and Julie
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新しいテクノロジーと芸術家――E・A・Tの活動にみる

ビリー・クルーヴァー
BILLY KLUVER

「芸術とテクノロジーの実験」(E・A・T)は一九六六年〝演劇とエンジニアリングの九晩〟に参加した芸術家とエンジニアの協力によって設立された。この組織は、新しいテクノロジーを素材として作品を作りたいと願う芸術家たちの要望にこたえて生まれたものである。

〝九晩〟の数週間後、個々の芸術家とエンジニア間のコンタクトを確立し、新しい科学技術を芸術家たちにも容易に入手出来るよう助力する組織を設立するにあたって、芸術家が実際に何を求めているのかという問題検討のための会合が開かれた。

この会合には三百人の芸術家が参加したが、そのうちの七十五人はすでに科学技術の助けなしには実現不可能なプロジェクトを持っていた。そしてこの二年余のうちにE・A・Tはおよそ千五百人の芸術家と、同じく千五百人のエンジニアを世界各地に持つ組織にまで成長してきたのである。その本部はニューヨーク市にあり、現在世界の多くの都市に独立したローカル・グループが設立され、それぞれ活動を続けている。

E・A・Tの幅広い目標のひとつは産業界に資金面の援助ばかりでなく、制作に必要な素材や設備、さらにエンジニアや科学者の提供を求めて、現代芸術作成のプロセスへの援助を呼びかけることである。第二の目標としては、科学技術分野と芸術分野間における個人レベルでの緊密な共同作業を可能にするということがあげられる。

芸術家が新しい素材の入手を望む時、エンジニアや科学者との個人的なコンタクトを通して入手するのが最も効果的かつ生産的な方法であるということを、われわれは〝九晩〟の経験から学んだ。こうして芸術家とエンジニアが、それぞれ個人的に芸術作品の制作に寄与するということを原則として両者の協力は始められた。一九六六年E・A・T設立以来、芸術家とエンジニアの協力によるプロジェクト推進の数は急速に増し、今日では一日に平均三組ないし五組のアーティスト、エンジニアのチームがE・A・Tを通して誕生している。

エンジニアの多くはゼロックス、ベル・テレフォン研究所、I・B・M、あるいはデュポンなどの大企業にゆくひとびとであるが、いずれの場合もこの共同プロジェクトでは、あくまでも個人として芸術家に協力するのであって、それぞれの属する特定の企業を代表するものではないのである。

共同プロジェクトは非常に複雑なものが多く、のべ何百時間にもわたって芸術家とともに仕事をするエンジニアや科学者も少なくない。一般に、企業側も自社のエンジニアがこのようなプロジェクトに参加することには好意的で、その成果を社内報に紹介している例も数多い。また、芸術家と仕事をしたエンジニアや科学者が本来の仕事に戻った場合、それまで以上に想像力豊かになり能率も増す傾向があるともいわれている。事実、芸術家に協力したエンジニアが、その仕事の後、企業内でより重要なポストを与えられるようになったという例も多い。

エンジニア側から見た協力の主な動機は、このような共同プロジェクトでは、自分と芸術家とが自分たちの思い通りに仕事ができるという満足感、さらにその成果が社会的評価を受ける機会が多いということにあると考えられる。過去二年余の間にエンジニアが芸術家との共同作業に費やした時間は概算して四、五万時間にも及んでいる。これは勤続年数にして二、三十年に相当する。

制作のための材料入手に関しては、芸術家が直接企業の中級幹部とコンタクトする方法がとられ、これはきわめてスムースにいっている。この際、芸術家のコンタクトを容易にするために、E・A・Tは手紙や電話によってあらかじめ企業に連絡をとっておく。米国の場合、このような交渉はトップ・マネージメントを通さずに行なわれることが可能である。

長期にわたってエンジニアの協力を必要とするプロジェクトの他にも、E・A・Tでは例えばプラスチックやレーザーはどこに行けば手に入るか、あるいはエレクトロニック装置はどこで利用できるかというようなごく簡単な技術上の問題にこたえるための情報サービスも行なっている。E・A・Tのスタッフに問い合わせれば、その場で情報が手に入る場合もあり、また必要に応じてはメンバーのエンジニアに照会する。なお、これはすべて無料で行なわれている。

またひとつの試みとして、昨年、芸術家のために一流の科学者とエンジニアによる講演会を三十回開いた。ここで扱われたテーマの中には、ホログラム、レーザー、新しいプラスチック材、音、紙、色の原理、電子計算機などがある。このシリーズが成功をおさめたので、E・A・Tでは再度このシリーズを計画し、美術学校、大学、あるいはニューヨーク以外のE・A・Tグループなどが自由に利用できるビデオ・レコーディングを作成する予定である。この他に最近新しくE・A・Tによって開発された領域では、芸術家を危害から守る安全措置、そして美術館や画廊が衛生当局と交渉を行なう際の助力となるセーフティ・プログラムがある。最近開かれた宇佐美圭司の展覧会でも、E・A・Tはニューヨーク市の衛生当局との交渉に奔走し、その努力の甲斐あって、彼のレーザー光線による作品は、目下ニューヨークのジュウィッシュ・ミュージアムに展示中である。

芸術家とエンジニアの交流をはかるために最も役立つと思われるのは、〝オープン・ハウス〟と呼ばれるものである。毎日曜日の二時から五時まで、E・A・Tのオフィスは芸術家とエンジニアの集会の場所として開放される。ここで彼らはテクノロジーや新しい素材についてのディスカッションを行ない、芸術家たちはそこでプロジェクト実現の糸口を見出すのである。

芸術家にとって非常に将来性があると思われるプログラムに〝アーティスト・イン・レジデンス〟(嘱託アーティスト)というのがある。これは、芸術家が企業体の中に入り、一ヵ月から一年まで、ある一定期間その企業の中で仕事をするという仕組みである。現在のところ一例が実現されているが、間もなくその数もふえる予定である。企業という環境の中で仕事をする時、芸術家は多くの問題に直面する。このような芸術家と産業界の間にあることばのカベを打ち破ることも、E・A・Tの一つの役目なのである。

新しい素材とプロセスに芸術家がどんなかかわり合いを持つかということにたいして、産業界や一般のひとびとの関心を高めるために、E・A・Tは大規模なプロジェクトも計画する。その最近の例では、一年前に発表されたエンジニアの芸術作品への貢献を競うコンペがある。この時の第一位はジャン・デュプイの作品 “Heart Beats Dust” に協力したラルフ・マーテルとハリス・ハイマンで、この二人には賞金百万円が贈られた。第二位の三十五万円はルーシー・ヤングの “Fakir in 3/4 Time” の制作に協力したニールス・ヤング、およびウェン・イン・ツァイの “Cybernetic Sculpture” に協力したフランク・ハリスの二人に与えられた。一九六八年六月一日までに百三十七点の作品がE・A・Tに搬入され、これらはすべて無審査で展示された。“Some More Beginnings” と題されたその展覧会は、同年十一月二十四日からニューヨークのブルックリン・ミュージアムで開催され、非常な成功を収めた。*

今後、E・A・Tは、現代芸術家の才能を生かした多くのプロジェクトに参加協力して行くことであろう。しかしE・A・Tの役割は、その制作プロセスに参与するためだけのものであり、作品の美的問題に関してはまったく見識を持たない。われわれは現代芸術家が直面している外面的(フィジカル)な問題を認識し、それらの問題が日ごとに増しているという事実も知っている。E・A・Tの目的は、技術的訓練を受けていないひとびとにも、新しいテクノロジーが使えるようにすることなのである。

われわれは、こうして各分野のひとびとの協力によって、個々のプロジェクトを推し進めて行くプロセスの重要な一環であると考えているのである。 (一九六九年一月二十九日)

中谷美二子・訳

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ATLANTA, MAY 1969 EXCERPT

THE CITY

The Arts Festival: "I don't know much about electronics . . ."

☐ Turn off the tube and pack the picnic basket. It's time for the annual culture fair and Art market known as the Atlanta Arts Festival in Piedmont Park (May 18-25)—with several notable additions and extensions. This year, E.A.T. *(Experiments in Art and Technology)* is experimenting in the park, and a group of artists and technicians called *The Guild* is providing a week of multi-media demonstrations in the Studio Theatre of the Memorial Arts Center on Peachtree Street (May 24-31).

It's all a far cry from the first Atlanta Arts Festival staged in a backyard in Buckhead fifteen years ago. Carolyn Becknell Mann, an interior decorator and one of the organizers of the first festival reminisced: "Two teachers of what we might call 'psycho-ceramics' were planning a small therapeutic outdoor exhibition of their students' work. Idea! Why not include the work of all those part-time painters, sculptors, and craftsmen who had no place to show or sell their work? I had a university degree in painting myself, and there were no galleries. The idea spread, and we finally had a group banded together to stage Atlanta's first Arts Festival.

It was not a new idea. The first arts festival in America had been held on the Boston Common in 1952. And it had flourished, adding to the displays of painting and sculpture such feats as the Boston Symphony playing Handel's *Water Music* while cruising the pond on a barge.

Atlanta seemed ripe. Once the word was out, paintings, sculpture, pottery, and jewelry seemed to appear from out of the pines, along with volunteer labor. There was a traffic jam in Buckhead the day of the one-day festival, and it was held over for a second. When everything was tallied, there was an estimated attendance of two thousand, $1,000 in sales, and $300 in expenses.

"There was a wonderful feeling of camaraderie and fun in those early days," Mrs. Mann recalled. "I think we caught the sprit in the Festival's first trademark —the Mona Lisa under a circus tent. My favorite definition of art is Sir Herbert Read's: *The purpose of art is to brighten things up a bit.*"

The second year, the Festival was moved to Piedmont Park amidst the stone planters, terraces, and steps built for the Cotton States and International Exposition of 1895, which was before anybody had ever heard of an arts festival, but the exposition featured some "art" of sorts—Buffalo Bill Cody shot 'em up, John Philip Sousa debuted his "King Cotton March," and Victor Herbert conducted "A Salute to Atlanta."

Today, the Arts Festival of Atlanta is an incorporated non-profit organization supported by approximately one thousand dues-paying members. There is a full-time paid coordinator installed in offices at Fifth and Peachtree Streets. However the festival is still a labor of love performed essentially by volunteers. Members get a newsletter and admittance to several parties during the year. The most exceptional affair this year centered around a special showing of art from outstanding Atlanta collections, a representative and surprising scattering from Norman Rockwell to Andy Warhol.

The budget for the annual festival is now somewhere around $50,000 with an estimated attendance of three hundred thousand. Last year, there was $20,000 in sales. The Festival takes a 20 per cent cut and the rest goes to the artists. An annual auction of art prior to the Festival raises money for purchase prizes at the Festival. Purchases are placed in public buildings and schools. There is also a fund for grants to artists.

There has been one consistent battle over the years—"professionals" against "amateurs" and vice versa. There was a time when artists were asked to decide which category they wanted to enter. Currently, there are no categories—let the egos fall where they may. Judges, usually from important schools and museums in other regions, are big names in the Art Business.

Three years after moving to the park, performing groups were added to the roster of events. On the makeshift stages there were plays, ballets, and operas to a background of *beep beeps, bow wows* and "Henry, if I've told you once I've told you a thousand times . . .," and there were bands, tumbling teams, bell ringers, marionettes, and "pantomimic musical revues"—a folksey conglomeration for and by gentle friends and neighbors.

With the "culture boom" of the mid-sixties, arts festivals sprang up in shopping centers and expressway-side hamlets all over the country, thriving where there was a sense of community and a need to exhibit local talent. The Boston festival is now defunct. Some say it died because it did not keep up with the needs of a rapidly changing city. There may be a change in the Festival in Atlanta, where there are now art galleries, theatres, and a shining new Culture Palace, and where outlying communities are busily staging festivals and "furthering the arts" with previously unknown zeal.

The most recent addition to the Atlanta Festival has been brought on by a national trend to link Art with Technology. It is sometimes known as *The New Combine*. It seems that tuned-in artists of the day are using the materials, the tools, methods, and imagery of the new technology. They are in full partnership with the machine and are turning out what might be called *art* in new forms. In the process, they have begun to make liasons with scientists and engineers. There are those who believe that this joining of science and art will produce more exciting and livable environments for us all.

This does not mean that there are not plenty of people still smearing paint on canvas for one reason or another, but if your immediate conjured image of an "artist" is someone in a beret behind an easel, you've probably seen *La Boheme* too many times. Your "artist" may be phoning in his "sculpture" to a body shop or sitting down with an engineer or a computer to plan an "environment."

The whole thing got off to an official start about three years ago with *Nine Evenings: Theatre and Engineering* in the Sixty-Ninth Street Armory in New York. Artists and engineers had worked together for almost a year planning "theater pieces." There were all sorts of variations on the art-technology theme. For instance, in one piece, a man had an amplifier strapped to his body which magnified internal thumps, gurgles, and what-have-you as he moved. Meanwhile, his image was projected onto a rather large television screen, a "dance" to a new kind of "music." Air waves from a local radio station turned various lights on and off.

The loosely-knit national organization *Experiments in Arts and Technology, Inc.* (E.A.T.) sprung from *Nine Evenings*. J. Wilhelm Kliiver, an electrical engineer with Bell Telephone Laboratories in New Jersey, coordinated the events and virtually created E.A.T. In an ART IN AMERICA interview, he said that "an industrially sponsored effective relationship between artists and engineers will lead to new possibilities which will benefit society as a whole."

The Atlanta chapter of E.A.T. is headed by Robert Allen, a designer and former painter who announced that he "stopped painting six years ago and stopped looking at painting five years ago." He finds E.A.T. a useful source of technical information in designing furniture, rooms, and shopping centers. Unlike the New York chapter with an artist to scientist ratio of forty to one, E.A.T./ATL(anta), one of the most active chapters in the country with about one hundred members, has a preponderence of scientists and technologists. There are monthly meetings at the Galerie Illien, Fourteenth Street and Peachtree, and membership dues are $5. Members are kept informed by newsletter.

The Arts Festival offered E.A.T./ATL $1,000 to do two experiments in the park. One of these is an "environment," an inviting womb-like chamber designed for "participation." Inside, there is a "color organ" which produces a changing array of colored lights to electronic music. . . The organ is actually a switching device which categorizes sound. Bass notes, for example, turn on green lights and so on. The whole idea is that of an electrical engineer.

The other experiment is a "light tower about twenty feet high which has been placed in the middle of the lake. Several Lockheed scientists, including a rare expert in optic phenomena, have gotten together the technical information required to build the tower. It is based on clever manipulations of the reflections and refractions of light and a phenomenon called "Moire Interference," much too complicated to go into here.

The Georgia Art Commission and the Arts Festival have commissioned a week of multi-media demonstrations in the Studio Theater of the Memorial Arts Center for a total of $1,000. The price also includes arranging experimental performances in the park. Admission is free. The producing company is called *A Research Institute and Production Coordinating Guild for the Arts, Inc.* Its founder, Tullio Petrucci, a teacher at the Atlanta School of Art, calls it "The Guild" for short and says that its function is "to do large-scale complex commissions which need the coordinated efforts of artists and engineers."

Many of these events in the theatre will involve projected images, moving and still, on three screens. Actors and dancers will play against and with the projected images. There will be electronic music, of course, and experiments with new materials. One of the pieces is called "The Machine I Love" and another is about "a college student's attempt to overcome alienation," written by a college professor.

An engineer from Lockheed and a technologist from Emory have collaborated on a computerized system which will *program* all programs. A computer, in essence, will act as stage manager and will control motion picture and slide projections, lights, audio, and stage cues.

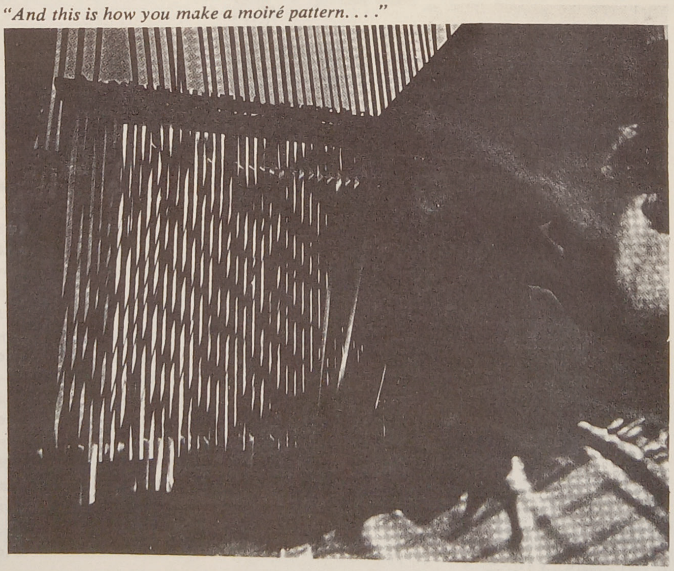
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Is this what you call ART?

I don't know what to call it anymore. Virginia. But it might brighten things up a bit.

—*Wylie Davis*

"And this is how you make a moiré pattern. . . ."



THE ATLANTA JOURNAL

Arts

By ANN CARTER
Atlanta Journal Arts Editor

The 1969 Arts Festival of A
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—Wylie Davis



THE ATLANTA JOURNAL, MAY 18, 1969 | EXCERPT

Arts Festival Opens Here Today

By ANN CARTER
Atlanta Journal Arts Editor

The 1969 Arts Festival of Atlanta opens at Piedmont Park today, from 10 a.m. to 10 p.m. in all likelihood with more public curiosity generated than in years past.

One factor sparking interest is that juror James Harithas, director of the Corcoran Gallery in Washington, D.C., selected an art show of relatively unknown artists—many of them students.

In other words, some artists who are veterans of the festival—many of them teachers—failed to be included. The number of artists is considerably smaller than previous years—by about half.

WITH A THEME of experimentation in the arts, technology and psychological science, the festival promises to have another radically new look.

The invited show is two works by members of Experiments in Art and Technology's Atlanta chapter. Lockheed-Georgia Co. scientists Robert Kyle, who works in computer graphics, and Dr. Leonard Lipson, researcher, have designed a 12-by-12-foot billboard of moire patterns which will stand in the middle of the park's lake, reflecting lights beamed from the shore.

The optical feat planned for the display is that the billboard may be one color while its reflection on the lake is another. Moreover, the reflection may change so that all, a portion, or none is visible.

The other E.A.T. work is an inflated plastic chamber containing a color device and patterned neon floor which change hues in time to electronic music composed by Dick Robinson.

Creators of the chamber are designers Bob Allen, Ed Moultrie and James Mount in collaboration with Dan Matthias, Lockheed electronics engineer. Bill and Bob Tolar of Spatial Effects developed the equipment.

To see the inside chamber a person must work his way along a narrow tunnel and poke his head through a tight membrane which vibrates in time to the music.

Another special attraction is the art and psychology program coordinated by Brena Frey, who calls the project "an experience in non-verbal communication."

She uses sound, light and other sensory media to create an environment in which participants find individual meaning which they transmit to others through group interaction.

STARTING May 24, in Studio Theater of the Atlanta Memorial Arts Center, a group of artists and technicians called A Research Institute and Production Coordination Guild for the Arts, Inc., known as "The Guild" will produce a nightly series of media art starting at 8 o'clock and will continue through May 31

BIJUTSU—TECHO, SPECIAL ISSUE, MAY 1969 | EXCERPT

芸術家と技術者
—EATの場合—

ビリー・クリューヴァー

3千年も昔，中国に生まれた花火はおそらく高度な技術が人間生活に詩と神秘性と喜びを与えるために使われた最初の例であろう。<演劇とエンジニアリングの9晩>の試みが，このように長く人々に忘れられていた花火にも似た役割を果してくれることこそわれわれの願いであった。EAT東京の設立を機会にEATを生む母胎となった<9晩>が，どんな形で始まり進められていったか，その過程をエンジニアの観点からもう一度追ってみよう。

<9晩>に参加した10人の芸術家と，ベル・テレフォン研究所所属の個人的に興味をもった技術者グループが初めて一堂に会したのは，公演の丁度9カ月前，1966年1月のことであった。この第1回のミーティングは多分に失敗の要素を含んでいるように見えた。みんな互いに相手を何となし恐れていて，胸襟を開いて話し合うというわけにはなかなかいかなかった。どういう形で口を切ってよいものやら見当もつかない風だったが，やっと技術者のうちから「芸術家たちが使えそうなものを話してみようじゃないか」という声が上った。閉された氷はどうやらゆるんだようだった。こうした会合が自由討議形式でおよそ12回にわたって開かれ，芸術家たちからいろいろなアイディアが出され，技術者側からもそれらに対応した提案がつぎつぎに出された。それらの多くは全く奇想天外で素晴らしかったのだが，同時に実現不可能でもあった。しかしとにかく3カ月後には機械装置を作り始めるという段階にまで発展していった。そして9カ月の成果が<9晩>で披露されたわけである。

この9カ月の共同作業は口でいうほど容易なものではなかった。エンジニアの仕事は遅々として進まなかったし，芸術家はそれ故に非常な忍耐を余儀なくされた。エンジニアの方は芸術家の漠然とした要求——これは実際そのものに手で触れてみることの出来ないという事実に起因するのだが——を具体化するのに並々ならぬ苦労をした。それはまるで髪の毛で人間1人を宙につり上げるような芸当だった。全部を一度につかんで持ち上げないと成し得ないというわけである。

<9晩>の技術装置に使われた費用は実費だけで3万ドルを越える。この他各分野の専門家から金額に換算できない貴重なアドヴァイスと援助を得た。にもかかわらずこれらの装置が技術者の立場から観て素晴らしいものであったと断言するのは少々無責任な話である。それらはアポロ計画や大規模なコンピューターに比べれば，まるでピーナツのようなものであった。これは当然のことであろう。芸術家がたとえ高度のテクノロジーを使う機会を得たにしても，その最も精巧且つ複雑な面を自由に駆使することは先ず不可能であったろう。何しろ芸術家にとって全く新しい器材との対決であったのだから。<9晩>のために作られた装置のユニークな役割は何かといえば，それはこれらの装置が公演を唯一の目的としてその一部として作られたものであり，他に用途は何一つ考えなかったということであろう。この装置は全くゼロの状態から作り上げられたものであり，芸術家とエンジニア間のダイレクトな相互作用の結果として生れたものであった。

これらの装置を開発していく途中で，商業的に採算のとれる発見がなされる可能性がなかったわけではない。例えばロバート・ホイットマンと一緒に仕事をしているうちに，われわれは赤外線レーザーの研究において既に重要なポイントになっている鏡の再発見をしたのである。この他商業的に将来性のありそうなものには小型増幅器がある。しかしこういった実用ばかりでなく，芸術家とエンジニアの相互作用によって産業界にもたらされるフィードバックは，あらゆる面で非常に重要である。芸術家が専門技術を使って多くの重要な可能性を開発することが出来るためには産業界のバックアップが何より必要である。芸術家はエンジニアが技術の新しい扉を開く手助けをし，またエンジニアは芸術家に詩を生み出すための新しい通行票を与えてくれるのである。技術は人に喜びを与え，人生をより楽しいものにする大きな可能性を秘めている。

EATの発足以来，これまでにおよそ500例の共同制作が実現されてきた。「エンジニアや科学者にとって何か良いことがあるのですか」という質問をよく受ける。社会的に安定した仕事をもち，それに没頭して時間に余裕もないエンジニアや科学者が，何故慣れない異質な状況にわざわざとび込んで芸術家と共に仕事をしなければならないのだろうか？ それは即ちその状況こそリアルであり，刺激に満ちているからである。エンジニアにとってそれは重要なことである。芸術家との相互作用にあっては，エンジニアは一つの挑戦的な状況の中で自らの専門技術を使っているのである。芸術家のアイディアは企業の研究室で生れるものとは全く異なっている。その上彼は自分の仕事を全面的にコントロールし，芸術家のもつイメージをいかにして実現可能にするか自ら決断を下しながら遂行していく。それこそ人間的状況というものであろう。芸術家と共同制作をしたエンジニアにとってその状況は極めて自然なものとなる。エンジニアは自分の専門技術をあるユニークな状況に適用させる。そして最終的には出来上った作品に対し，芸術家と同じだけ責任をもち，又同じほどその作品の一部となるのである。

芸術家はテクノロジーに新しい内容を与え，芸術家—エンジニア共同プロジェクトは芸術とテクノロジーをこれまでのお互いの孤立状態から引き戻し，より深く社会とのかかわり合いを持たせる糸口を与えてくれる。共同制作の成功は，芸術家とエンジニア，科学者がわれわれの未来の環境造りに積極的に働きかける可能性を示すものである。

（訳：中谷英二

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ルポルタージュ

アメリカに見るグラフィックとエンジニアリングについて

ヤシア・ライハート

凍えるような寒さの1月のある日，私はニューヨーク東16番街にあるEATのロフトを訪ねた。EAT とは Experiments in Art and Technology（芸術とテクノロジーの実験）の略称である。毎週日曜日，そこでは芸術家とエンジニアの会合が開かれ，参加者はそこに種々の新しいプロジェクトを持ち寄り，その可否を討論した上で共同制作に入っていくことになっている。

私はロンドンのジャーナリストですが——人いきれのするロフトで私は一人の若者に近づいて言った——あなたはエンジニアですか，それとも芸術家ですか。若者は，自分はエンジニアであると答えた。何故，今日ここにいらしたのですか——私は尋ねた。日曜日の午後，何かすることがないかなと思って来たまでですよ。なるほど，もっともな理由というものだ，私はそう思った。

あなたは芸術家ですか，それともエンジニアですか——私はあたりの雰囲気にすっかり溶け込んでいる様子の若い女性に聞いてみた。芸術家です，と彼女は言った。この会にはもう何度も出ていらっしゃるのですか。ええ，日曜日には必ず来るわ。私は腰を下して，私が企画した人工頭脳派（ライヘキノウハ）——コンピューター・グラフィック，人工頭脳環境（ライヘキノウクワンキョウ）コンピューターによる作曲と演奏，ロボット——のことを彼女に話してみた。人工頭脳って何ですか，15分ほどしてから彼女は言った。一体何故，あなたはここに来ていらっしゃるのですか，私は皮肉をこめて言い返した。いろんな人に会うにはもってこいの場所だからよ，彼女はいかにも邪気のない明快さで答えた。

ここが芸術とテクノロジーの結合の起り得る場所なのだろうか。私は既にEATがその目的を達成しようとするやり方に非常に根本的な誤りがあることに気付いていた。

EAT そのものは設立以来，既に1年半の年月を経て来ている。元来，アメリカに生れたこの組織は今では世界中に支部をいくつか持っており，それぞれ，非常に野心にあふれたプログラムを持っている。1966年，ニューヨークの造兵廠で開かれた一連のハプニングの残滓，それがEATである。そのハプニングには，芸術家，舞踊家，作曲家に加えてベル・テレフォン研究所に勤務する人々を主力とするエンジニアが参加した。演劇とエンジニアリングの9晩と呼ばれたこの催しは，芸術的にも技術的にも完全な失敗であると言われたものであった。出しものはいずれも退屈なものばかりであったし，技術装置も思い通りに働かなかった。しかし，それにもかかわらず，ベル・テレフォン研究所のレーザー研究の専門家であるビリー・クルーヴァーと芸術家のロバート・ローシェンバーグは EAT を発足させた。

私は芸術とテクノロジーの間に何らかの連関があるのではないかと思って情熱を注いで研究を続けているのだが，今もって EAT そのものと，その目的とするところには疑問を抱かざるを得ないのである。私の抱く疑問とは極く単純なことである。EATの組織はエンジニアと芸術家の協力を助長，促進するためエンジニアの共同制作が全く行なわれていないと言う訳ではない。しかし，それらはもっと自然な形で起ると言ってよいだろう。気概のある芸術家ならば，例えば水の彫刻を制作しようと思えば，どこに出かけて，誰の助けをかりればよいかを調べて，水力学についての充分な知識を求めること位はするはずであるというのが私の信じるところである。それに，エンジニアリング，物理学，数学などの専門知識を持った芸術家も少なからずいるが——彼らの多くはニューヨークのハワード・ワイズ・ギャラリーで展覧会をしている——こういった人々は組織化された共同制作を避けようとする傾向がある。

Experiments in Art and Technology とその官僚臭の強さはMIT（マサチューセッツ工科大学）のプロイサー教授の主宰する視覚教育学部のあり方と明白な対比を見せている。同学部では "芸術" ということばこそ使われてはいないが，そこで創られるものは英国の美術学校で美術と呼ばれているオブジェや絵画と非常に似通っていると思われる。芸術作品を創ろうとか，芸術家になろうとかいう意図のない学生の手になったにもかかわらず，視覚的に非常にすばらしい作品を見て私は驚嘆した。それは単に平面と立体の中にある一つのアイデアを視覚的に求めただけのものであったのだが。MITのプロイサー教授のスタジオと英国の美術大学の間に何か異なった点を特に指摘するとすれば，英国とは全く違って当地では6×10フィートというような巨大なカンバスが極くあたり前のことのように使われているということと，立体構成は非常に高度な技巧を駆使して完ぺきに仕上げられているということ位であろう。英国の構成派（コンストラクティビスト）の一人であるメアリー・マーチンの作品をほうふつとさせるような白と黒の正方形を積み重ねた作品があったことを思い出す。「ああ，あれですか——あれは単に集合論のテーマについて立体的考察をしたものですよ。」——その時，教授は私にこう言っておられた。私はいたく感銘を受けた。それは，その作品がすばらしかったからというだけではなくて，建築学部や理学部の学生が一般教養の一部として視覚教育を受けているということに感心したものであった。その時，私はプロイサー教授のコースを取ったエンジニアならば，その人が万一，芸術作品を創ろうと思い立った時に，芸術家と共同制作をしなくても，おそらく一人でやれるだろう——と思った。それにひきかえ，芸術家は大学時代に直接エンジニアリングを体験することは非常に稀であることが分った。英国ではアメリカ以上にその傾向が強くて，芸術学部は大抵の場合，総合大学の中の一部分でしかないのである。

彫刻作品をものするエンジニアがいると言っても，それは極く少数の例外的な人々のことであって，アメリカにはそのようなエンジニアが掃いて捨てるほどいると言っている訳では決してない。この2カ月の間に，私はそういった人，6，7人に会ってはいるけれど。その中には，はじめにエンジニアリングあるいは数学や物理学を学び，その後に視覚芸術とか音楽の学位を取った人もあった。

ピッツバーグのカーネギー・メロン大学で

この点に関して私の興味をそそったのは，レオナルド・ダ・ヴィンチの絵画をコンピューターにかけて変形し，再生した場合，学生の描いた平凡な人物画を同じプロセスで処理した場合よりもはるかに美しい作品が出来上るということであった。現在，コンピューターをかなり自由に使える立場にあるクスーリ教授はコンピューターによる彫刻を計画中である。

しかし，アメリカの有名大学の場合でも，コンピューターを使える時間はかなり制限されているという問題がある。ハーヴァード大学のコンピューター・グラフィック科でもそう簡単にコンピューターを使うことが出来ないのが実情で，そのためわざわざ2マイルもはなれたMITに行って友人に依頼していることが多いという話だった。

EATでは芸術作品の制作のためにエンジニアと芸術家は一致協力すべきだとして，その方向に積極的な運動をしているがその反面ではアメリカ全土において，程度の差こそあれ，真剣なエンジニア達は広い意味での芸術のいくつかの局面を探求しているのである。中には，既に意識的にそれを仕事にしている人もあり，事実，シャーロッツヴィルに住むあるエンジニアは自らコンピューター・クリエーションズと称する会社を作って，まあ "美しい" とは言えるものの，さして注目するに価しない色つきのコンピューター・グラフィックを作り，一枚50～200ドルでかなりの枚数を販売している。

私は若い数学の卒業生に会ったが，彼は丁度，視覚芸術の学士コースの仕上げにかかっていた。彼はコンピューター・グラフィックとコンピューター動画の制作にほとんどの時間を投入していたが，初期の作品と最近の作品とでは格段の進歩をみせていることが印象的と言えば言えた。これらの作品はコンピューターによって動くタイプライターで作られたもので，それぞれのイメージは文字と数字から成り，特に濃い部分は文字を幾重にも打ったものであった。この若者はデュアン・パリカという名前だったが，彼の作品の質よりも，彼に自由にコンピューターを使う時間を与えたり，激励したりして彼を援助している教授達に私は興味を持った。

コロンブスのオハイオ州立大学では，芸術学部教授，チャールズ・クスーリがコンピューターの空時間を利用してコンピューター・プログラミングの勉強をしていた。この二年の間に同教授は数多くのコンピューター・グラフィックやコンピューター動画を制作している。大部分の作品はコンピューターに操作させたペンでX—Y製図機を使って紙の上に描かせたものである。同教授はコンピューターによる作品を制作した数少ない芸術家の一人であり，しかも雑誌「コンピューターとオートメーション」の年一度のコンクールでコンピューター・グラフィックの最優秀賞を獲得した最初の人でもある。彼の作品は古典絵画に加えて，自作の線画をコンピューターにかけてイメージを細かく分け，その細片を組みあわせて次第に変形させ，色を随所にほどこしたものである。

EATの活動はいささか自意識過剰気味で無理をしているところがあるのに反して，他に見られる活動はより自然発生的であるということである。だからと言ってこれは作品の質とか形式には関わることではない。大部分のコンピューター・グラフィックは，未だ並の域を出てはいない。そこに見られるのはすべてわれわれの見慣れた芸術のスタイルの表現でしかない。私は静物やヌード，あるいは幾何学的なものや表現主義者の作品のコンピューター・グラフィックを見てきた。また，抽象画や動画あるいはその中間にあるいろいろな作風のものも見てきた。この発展の中に見られる主な興味は質でなくて量である。そして異様なスピードで描かれるイメージで塗りつぶされた何千枚もの紙がエンジニアによって，芸術としてではなく，自らの楽しみのためのグラフィックとして造り出されていくという事実であろう。

（訳：堀田よし子）

THE MINNEAPOLIS STAR, MA

Bureau
scien
'MATCH

By BEVERLY KEES
Minneapolis Star Staff Writ

Billy Kluver runs a kind of "d
work in which he matches art
scientists.

On the side, he is helping creat
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Kluver is president of Experi
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DR. BILLY KLUV

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Like a 'dating bure

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THE MINNEAPOLIS STAR, MAY 13, 1969

Bureau brings arts, sciences together

'MATCHMAKER' TELLS HOW

By BEVERLY KEES
Minneapolis Star Staff Writer

Billy Kluver runs a kind of "dating bureau," in which he matches artists with scientists.

On the side, he is helping create a pavilion for a world's fair in Japan in 1970.

Kluver is president of Experiments in Art & Technology, Inc. (EAT), which was set up to bring artists and scientists together for mutual benefit.



DR. BILLY KLUVER
Like a 'dating bureau'

For example, he said in an interview in Minneapolis, an artist may have a problem in how to use a new plastic or how to join two materials or how to use a laser beam.

He sends in a plea for help to EAT which matches him with two or three scientists working in those areas.

The usefulness to artists is obvious, but there is also a benefit for the scientist, Kluver, an electrical engineer, explained.

EAT brings the scientist in contact with the world of art, gets him out of his laboratory occasionally, which may be of practical use to business and industry, he said.

Management has tried to hold its brightest scientists by "building golf courses and swimming pools" to little effect, he said.

New interests

But giving the scientist exposure to another world and different challenges provides him with the variety and new interests to hold his attention and enthusiasm, Kluver said.

Business has responded by giving scientists the use of equipment such as computers and sometimes donating materials for use in EAT projects.

The organization grew out of a series of performances titled "Nine Evenings" put on a couple years ago by a group of artists and scientists working primarily out of AT&T's Bell Laboratories, where Kluver is associated.

Kluver and artist Robert Rauschenberg and a few others associated with "Nine Evenings" decided to establish a permanent collaboration between artist and scientist and EAT was born.

Kluver, in town to speak at the spring commencement exercises at the Minneapolis School of Arts, said EAT has branched out into several areas, such as open houses where members can discuss common problems and seminars on how to use a laser beam and not violate [illegible] of the public health depa[illegible]

One of the biggest p[illegible]s is a collaboration of EAT in New York, Los Angeles and Tokyo—the design of an Expo 70 pavilion, sponsored by the Pepsi-Cola, Inc.

Under a giant shell, shrouded in man-made clouds, visitors will don headsets and wander through an experimental environment of sound and sight.

It will, if nothing else, be new.

"Everything we do has not been tried," Kluver said.

THE ATLANTA JOURNAL, MAY 23, 1969 EXCERPT

AT PIEDMONT

Womb 'n' Board Lure Art Fans

By ANN CARTER
Atlanta Journal Arts Editor

Blinking lights and growling like famous headache No. 57, "the walk-in womb" at the Arts Festival of Atlanta is proving to be a popular attraction.

The display is an inflated plastic dome with a tunnel entrance, much like an igloo, which admits three or four spectators at a time.

People form a line of 50 or more to tour the "womb"—as its creators dubbed it—and usually come out with a perplexed, if not pleased, look.

THE WOMB was made by members of the Experiments in Art and Technology Atlanta chapter on commission from the Arts Festival.

The idea for the womb originated with Lockheed-Georgia Co. electronics engineer Dan Matthias who wanted to show off the features of a color organ —an electronic device which correlates sound into color.

He paired with Atlanta electronic music composer Dick Robinson. Soon they realized a proper theater was needed to house the organ, so other E.A.T. members came into the act: designers Bob Allen, Ed Moultrie and James Mount and Bill and Bob Tolar of Spatial Effects, Inc.

What they finally put together represents $500 in materials *plus 150* man-hours. The womb contains a floor of flashing neon lights, projected slides on the wall, endless variations of electronic music and a mysterious sphere.

Cool air pumped in by a centrifugal blower inflates the dome and should create a pressure state which enhances the music's beat, but vandals punctured the plastic walls, eliminating this effect.

ANOTHER E.A.T. project is a 1,000-pound object that was floated to the middle of the park's lake where it stands to reflect color lights from 20 sources along the shore.

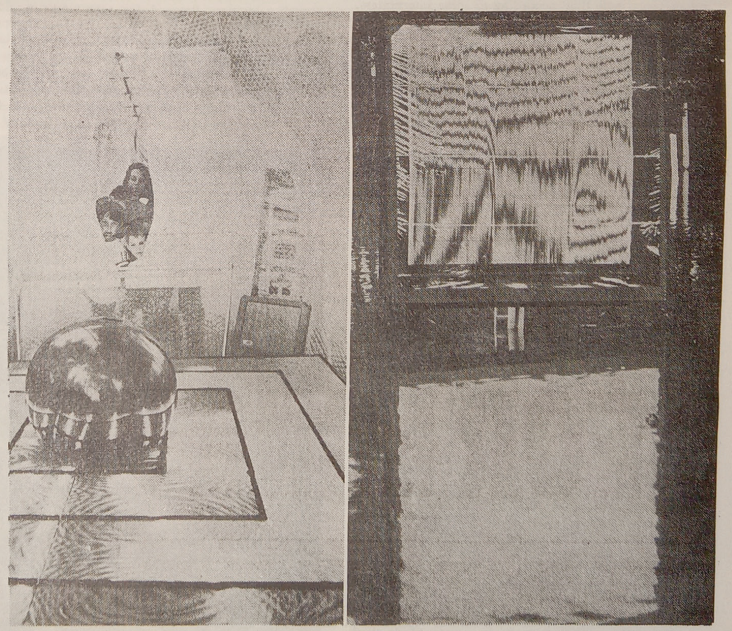
The object is a billboard-size sign coated with a reflective, beaded substance used on highway signs that indicate speed limit changes from day to night.

The "board" has two layers of magnetic tapes strung to create a moire effect of moving Zebra striped patterns.

Since reflection is directional, the sign's color depends on the viewer's position in relation to a light source.

If a person stands behind a yellow light the sign seems yellow, but his friend next to a blue light would see a blue sign. Someone in between the light sources sees a blending of the two colors.

In some instances the sign is one hue while its reflection in the water is another.



Staff Photos—Noel Davis

ARTS FESTIVAL VISITORS PEEK INTO LIGHTED 'WALK-IN WOMB' EXHIBIT (LEFT)
Sculpture in Park's Lake Adds Double Treat With Beauty Reflected In Water (Right)

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Art and technology

II. A call for collaboration

Nilo Lindgren Staff Writer

Engineers have begun to accumulate experience in various kinds of interdisciplinary ventures as, for instance, with physicians and psychologists. Now they are being asked to collaborate with artists in what could prove to be the most intriguing interdisciplinary adventure of all

As decribed in Part I, the collaboration of art and engineering in the creation of new art works has become a serious preoccupation of many modern artists, who are asking for the help of engineers. A number of organizations now exist whose aim is to facilitate the contact between artists and engineers and to help support them in their collaborative projects. You need not be a Renaissance Man, it is said, to apply for a match with an artist. It won't be all fun and games, although part of it will be, and you might even end up doing something so useless from an engineering point of view, and so right from another point of view, that you could begin wondering why engineering is practiced the way it is—i.e., you might get turned on. This article tells you a bit about what it was like for some others who have already tried, and calls on you to join the action.

Anybody who has read even a smattering of the art history of this century knows about the famous Armory Show of 1913 in New York. That "International Exhibition of Modern Art," held in the Armory of the 69th Infantry, punctured the United States' esthetic innocence with a revelation of the radical iconographic movements that had emerged in Europe. Containing such works as Marcel Duchamp's "Nude Descending a Staircase, No. 2," the show inspired much controversy. Though, in general, the contemporary press was critical of the show, there were some critics who recognized its importance, and what it heralded for the art of succeeding years. After the 1913 Armory Show, nothing was the same in U.S. art.

The second Armory show, "9 Evenings: Theater and Engineering," held October 13 through October 23, 1966, may have performed a similarly significant role. The performances, created jointly by artists and engineers in the first such collaboration on a major scale, were as much as anything the creation of environments. They were not, in any case, evenings of theater *in any traditional sense. Moreover, their creation served both as a manifesto* and as an experimental *probe.*[1]

Actually the experiment in art and technology that grew into the nine evenings of theater and engineering at the Armory in New York was originally scheduled as part of a festival of art and technology in *Stockholm; but the project to go to Sweden grounded on the very issue that, according to some interpreters, imparted to the nine evenings their unique significance* and their claim to success in the face of acerbic critical response.

At issue was the relationship between the artists and engineers. Stockholm wanted to supply engineering support in Sweden; the artists were, in effect, to give in their orders and the engineers would carry them out. But the New York group opted for what constitutes not only a different mode of doing business but a fundamental difference in esthetic outlook as well. The artists wanted the engineers to be in on the groundwork and planning, to engage in an ongoing dialogue with the artists, from the very beginning. To engineer Billy Klüver and artist Robert Rauschenberg, the two major driving forces of the 9 Evenings, the exploration of the *process* of collaboration constituted the fundamental experiment. It was even suggested at one point that the audience be allowed to come to the Armory during the days to see the preparatory work in progress.

Thus, the upshot of the dispute with Stockholm on the relationship between artists and engineers—which art critic Brian O'Doherty noted at the time as a "prophetic friction!"—was to lead to a pioneering venture. The New York artists wanted, as O'Doherty wrote, "to work with the technicians—follow their thinking, involve them in the artists' ways of thinking. This makes great demands on patience, mutual understanding, and above all, time. Ideally, it would acquaint the artists with their new materials, since art often arises out of the nature of materials themselves. This democratic idea is especially typical of Rauschenberg's equal respect for all materials, which in this case included people."[2]

Rauschenberg himself speaks of the waste of possibilities in using technology only to carry out some preplanned work, for the technology is then like a *dead* medium rather than an encounter. "I do think there are," he says, "definitely two attitudes toward technology, and the one of using technology as a servant I find very dull and outdated. It seems to me closed-minded." However, in an "open esthetic investigation, where it almost doesn't matter whether one makes art out of it or not, in which an art object may not even be produced," the purpose is not to move in a single direction. Instead of taking the materials and just executing something preconceived, if "from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece . . and it grows and grows . . . the whole world then is the medium, if you can relate in your esthetic to something other than the finished product."[3]

In this light, it is possible to think of the 9 Evenings as an experiment in which not only artists and engineers were engaged, but in which the audience was engaged as well, an experiment in which the consequences and the significance would not become visible until later—perhaps only in successive works. As O'Doherty wrote later, the evenings "received, on the whole, an appalling press—based mainly on the justifiable irritation of interminable delays, technical failures of the most basic sort, and long, dead spaces between, and sometimes in the middle of, pieces. Yet, as such irritations faded away, one is left with startlingly persistent residual images, and strong hints of an alternative theater that has been lagging in its post-Happenings penumbra between art and theater. . . ."[2]

And, with time, the afterlife of the 9 Evenings grows stronger. One critic who saw the evenings as a "total disaster" now concedes that the experiment stands as a kind of "inspired announcement."

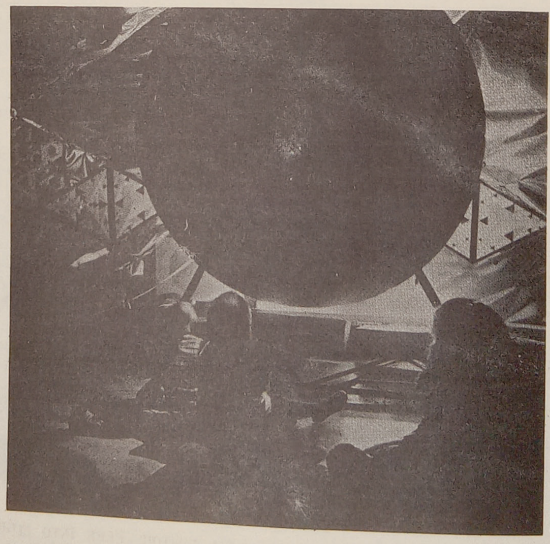
The '9 Evenings'—the collaborators

The artists involved in the evenings included composer John Cage, painter and playwright Öyvind Fahlström, painter and choreographer Alex Hay, choreographer Deborah Hay, choreographer Lucinda Childs, artist Robert Whitman who did some of the earliest "Happenings,"[4] choreographer Steve Paxton, composer David Tudor, choreographer Yvonne Rainer, and many others who contributed in performing, handling, and even helping build equipment. The engineers, recruited from Bell Labs, included: Per Biorn, who works in semiconductor research and who designed and built a ground effect machine for Child's "Vehicle"; Cecil Coker, who has worked on synthetic speech computers; Peter Hirsch, who works in underwater sound and who built an 80-kHz Doppler sonar for Lucinda Childs; Harold Hodges, who works in laser research and who designed and built an an..missile missile and floating snowflakes for Fahlström's "Kisses Sweeter Than Wine"; Jim McGee, who works on holograms but built programming drums used during the evenings; Leonard Robinson, who designed the power amplifier for a theater electronic environmental modulator, the most ambitious system designed for the evenings; Herb Schneider, who took over performance planning for all of the artists; Fred Waldhauer, who works on communications systems research such as digital transmission of video and who designed a unique proportional control system for the Evenings; Stretch Winslow, who heads up polymer research at Bell and who worked on chemical problems for the Evenings; Dick Wolff, who works on superconductivity research and who developed a radio loop system for Paxton's "Physical Things"; and others. Also participating in the early discussions were John R. Pierce, executive director of Bell Labs Communications Sciences Research, and Manfred Schroeder, director of Bell's Acoustics, Speech and Mechanics Research Lab.

The '9 Evenings'—ongoing work

After the ice was broken at the initial meetings of the artists and engineers, numerous suggestions began to emerge about what they might do—sonar to pick up body motions, walls made of warm air, floating bodies, the transduction of body functions into sound, the recording of actually viewed events so as to be shown either compressed or expanded in time along with the primal event, temperature- and pressure-sensitive colors, various forms of feedback, and feedback transformations. The suggestions were put forward in a fanciful form as though it were possible to do anything, as though unlimited funds, energy, and time were available. Said Billy Klüver: "The amazing thing is that it's possible for artists and scientists to talk together at all. The first meeting I was scared. Then, the minute it came down to the hardware it was working. It's like a triangle between the scientists, the artists and the hardware. The main thing is to establish a working relationship and the hardware is the basis for this." An identical idea is expressed by composer John Cage (statement printed in color, page 50).

As the collaboration developed, however, the ideas tended to evolve into two categories, into the development of individual pieces or components for the special requests of individual artists, and an overall system that would serve the needs of all the performances. The engineers set up a patchboard system, every artist's performance was prewired, and all the equipment he needed was hooked up by inserting his particular patchboard. It was a unique system. In all, over 350 boxes—amplifiers, relays, decoders, tone control units, transmitters, receivers, all interconnectable and battery driven—had to be designed and built. The idea, Klüver says, was to have on stage a portable electronic system that could be carried in



"ULTIMATE PAINTING," 1968 (right), by Clard Svenson and Larry Lard, is a Mylar stretched zonahedron dome environment. Inside the dome, a painted 1.5-meter-diameter disk spins, lit by four strobe lights, alternated with ultrasonic illumination in 20-minute intervals. The piece "Speak That I May See," 1968 (below), by Roberta Phillips and Copthorne MacDonald, is a life-size plaster and electronic sculpture. On its cathode-ray-tube face, one sees time-varying patterns generated by stereophonic music. All of the pieces in the E.A.T.–Brooklyn Museum exhibition were categorized as to whether they were planar images, reliefs, constructions, environments, processes, performances, and as to whether they generated sensory stimuli through light, sound, or heat sources, whether they incorporated moving parts, how their images were generated, whether they were interactive with the spectators or with the environment, and as to whether or not people were essential to the piece as in games and theater.

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THIS PIECE, an inflatable plastic environment by Pedro Lujan, whose "message" is clearly understood by the younger set, and the two pieces shown on the next page, were included in a large exhibition of about 120 worker involving collaborations between artists and engineers and using technical materials and processes. The exhibition, "Some More Beginnings," held at The Brooklyn Museum this winter, included all the works resulting from a competition sponsored by Experiments in Art and Technology, New York.

one's pocket. This system was to handle by remote control multiple sounds, lights, and movements of objects. Thirty separate projects, involving finally about 8500 engineering hours, went forward more or less simultaneously, each project originating from an artist's conception. For example, the engineers provided radio-controlled carts for Deborah Hay, infrared television for Rauschenberg, direct access to sounds all over New York for Cage (*he wanted* sounds, too, from *outer space*), a sound space for Paxton, snow*flakes that* went upward for Fahlström, and a proportional control system for Tudor, with which it was possible to modify lights and sounds by the movement of a flashlight over a photocell control panel.

The real experiment in collaboration did not, of course, go forward smoothly and all at once.[1] After months of preparation, it was a question up until the last minute, and even beyond the last minute, whether or not the evenings of art and technology would really be pulled off. The pressure of time, of working to a deadline in a totally new situation, seemed always to be in the minds of the artists and engineers. The period of preparation was one of great excitement and novelty, but it was one of growing anxiety and anguish as well. Starting in a void, as it were, the artists and engineers had met timidly at first, searched for ways to begin to talk to one another, searched for something they could do together in a hitherto unexplored territory.

One of the artists, the dancer Simone Whitman, said: "In many ways, setting up a working relationship was the biggest hurdle for some of the artists. Some didn't accomplish this till the end of the summer. Some never really did. Perhaps there was a lot of shyness on the part of both the artists and the scientists."[1]

Shyness, the consciousness that they were exploring a new undefined territory, anxiety that the use of the technological media wouldn't make a significant difference in the artistic results, the excitement of playing with materials on a scale that had not hitherto been possible, and the sense that they were shooting for something historic, were certainly components of that first collaborative experience.

Beyond that, it was an effort by artists to participate in a large collaborative situation beyond the control of any individual. This new situation, perhaps an uncomfortable and anxiety-making one for both artists and engineers, was to force the acceptance of new responsibilities—the need to state requirements and concepts clearly and to stick by the engineer as he pursued his design and construction, the obligation to wait while engineering work was being completed, and so on. The very mode of collaboration attacks the "old-fashioned idea that the artist is a very special kind of person, in the sense that he is mystical," unreachable, or incommunicado on his pedestal.

On the technical level, one of the most crucial problems was the integration of individual pieces into a system.

> Tried conversation (engineers and artists). Found it didn't work. At the last minute, our profound differences (different attitudes toward time?) threatened performance. What changed matters, made conversation possible, produced cooperation, reinstated one's desire for continuity etc., were things, dumb inanimate things (once in our hands they generated thought, speech, action).

The '9 Evenings' as performances

As performances the 9 Evenings differed from one another as much as the artists who created them. In Rauschenberg's "Open Score," for instance, imagine the action. It takes place in the enormous half-barrel-shaped space. The Armory floor becomes a tennis court, and as the two players hit the ball back and forth, its sound against the racket is transmitted from radios inside the racket handles, and amplified through speakers. As the play proceeds, the lights illuminating the court are extinguished one by one each time the ball is struck, until the stage is dark, at which time the game ends. At that point, hundreds of people move onto the Armory floor where they are illuminated with infrared lights; the crowd scene in the darkness is picked up with infrared sensitive television cameras, then projected on three large screens, so that the audience feels the presence of a large crowd without being able to see it except on the reproduced screen images. When the lights finally go on, the huge crowd of "actors" bows to the audience seated on the bleachers.

In Whitman's piece, "Two Holes of Water," the Armory space, in relative darkness, gradually fills up with automobiles driven in slowly, sheathed in plastic, announced by loud sounds as of warfare and political speeches. The cars maneuver into positions around movie screens that appear one by one around the Armory space, until one is viewing simultaneously about ten screens—showing animals running, penguins frolicking, planes taking off and landing backwards, cells dividing, a man and woman dressing and undressing, caressing, silently mouthed television advertisements, and landscapes going by—accompanied by the sounds of bombs exploding, aircraft, political harangues, typewriters clacking, and so on. One sees live actors on the stage being televised and, simultaneously, their televised images being viewed by the anonymous spectators in the cars, who are also being observed by the audience. This induces in the observer a gestalt of subjective responses, normally reserved for these separate images, which, in their radical juxtaposition in one's feelings, produce an insight into one's modes of "pattern recognition," of one's modes of taking elements of this technological world.

Whitman's was a beautifully choreographed piece, simultaneously both amusing and deeply moving, and riddled at last with the sad sense of how the available space of our world is filling up with the feverish productivity of technology.

More than this cannot be described here; the photographs on these pages suggest a bit more. For better or worse, the 9 Evenings now belong to the history of art and theater. They belong as well to the history of technology, not because they were technologically momentous, but because they were a foretaste—a first step toward a perhaps vigorous involvement and engagement of recently separate endeavors.

Not everything worked during the 9 Evenings, the "downtime" was considerable, the technology was, as Klüver admitted, peanuts; and the Evenings were still, as John Cage suggests, like the early movies in which the traditional stage, the new camera, the literary content, and the acting were identifiable components not yet integrated. But for those who participated, the Evenings were an achievement full of anguish and joy. For them, the experiment was a success—they had discovered, and came away convinced, that they could work together, and that a lot of energy has been wasted in the past in sustaining a supposed conflict between cultural specialists.

Collaborative organizations

There is now much evidence that the movements of certain artists toward engineers and technology, and toward the engineering industries, seems to be occurring spontaneously in many places. Almost every day, one hears of shows in art and technology and of groups and alliances being formed to advance the "new combine."

A conspicuous new feature of the Cambridge intellectual landscape, for instance, is a Center for Advanced Visual Studies at the Massachusetts Institute of Technology under the direction of the distinguished artist and professor Gyorgy Kepes. The new Center, housed almost symbolically in what used to be M.I.T.'s student cooperative store, aims at the collaboration of artists with scientists and engineers through the appointment of artists as Fellows of the Center for periods of two or three years. The first group of Fellows includes William Garnett, an aerial photographer; Vassilakis Takis, a Greek sculptor of kinetic devices controlled by magnets; Harold Tovish, the producer of recent mirage-like optical sculptures; Otto Piene, a German artist known for his light sculptures, light ballet, and multimedia performances —in Düsseldorf he belonged to *Group Zero* whose members often did art works of a transitory nature and stressing their "phenomenological" character; Jack W. Burnham, a light and kinetic sculptor; and John Whitney, who has made computer movies. The artist–Fellows not only engage in seminars and meetings with M.I.T. scientists, but they work together as well on ways in which to use light in large-scale environmental forms. A monumental sculpture of light in Boston Harbor is one of the projects under consideration.

From Kansas City a year ago came news of another venture like the 9 Evenings—the creation of "The Magic Theatre" at the Nelson Gallery of Art, a collaborative venture of the museum, artists, the Kansas City Performing Arts Foundation, and more than 40 local and out-of-state industries, which contributed nearly a half-million dollars of man-hours and materials.[5] Eight enviromental art works, which required a massive technical collaboration, were created by artists Stanley Landsman, Howard Jones, James Seawright, Charles Ross, Robert Whitman, Stephen Antonakos, Boyd Mefferd, and Terry Riley.

Kansas City's "Magic Theatre" title is said to have been selected from Hermann Hesse's novel *Steppenwolf* but what has not been mentioned is that Hesse's "Magic Theatre" also had a subtitle—"Entrance Not for Everybody"—which is apt, because all the ventures mentioned thus far were collaborations of rather exclusive groups.

But an organization devoted to the collaboration of artists and engineers for whom entrance *is* for everybody now does exist—any artist and any engineer can join it free merely by letting the organization know that he is interested in experimental collaboration; and any industry, company, foundation, or whatever, may support it if it wishes by allowing its engineers to work collaboratively with artists, by allowing artists to come into its R&D and production facilities, by donating equipment and components, or by giving money, preferably in thousand-dollar chunks every year, and sustaining such support over many years. The new organization, called E.A.T. (Experiments in Art and Technology), is prominent not only for its joyful democratic principles (conducted in a free-

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spirited and slightly anarchic atmosphere where each person does what he does best); it is prominent, too, because of its scale of ambition, its breadth of contracts, and its seriousness of purpose in creating a healthy freeway between artists and engineers not only so that they can find one another in the first place but also by supporting the ongoing work-dialogues that are established. Moreover, any engineer or artist who wishes to contact E.A.T. to establish a collaboration need in no way be convinced that he is a "Renaissance Man." The collaboration may even go better and be more exciting if he isn't.

The need for some form of organization to facilitate engineer–artist contacts had been demonstrated in many ways. A growing number of artists everywhere are hungry for engineering help. For instance, even before the formation of E.A.T., a relatively unadvertised meeting, asking for artists and engineers who might be interested in collaborative projects, brought a turnout of over 300 artists, 75 of whom brought with them pending projects for which they wished immediate engineering assistance. Rauschenberg says that on his travels to South America and in Europe, the situation is the same. The young artists do not even manifest much interest in pop art; it is about art and technology that they ask.

Thus, it was clear that a practical pathway needed to be opened up so that artists could get to engineers, could get into industry, to get scientific and engineering information, and that real financial support was needed for artists who wished to work in an inherently more expensive medium. The chief question was how to reach the engineers and let them know how much they were wanted, because the artists could not hope to have access to the most sophisticated and advanced technology without gaining access to engineers.

Probably more than any other single factor, the preconceptions that engineers and industrialists held about the character of art and the character of artists had to be unfrozen. For it is undeniable that for most of us who have been nurtured on earlier painters—those of us who have grown up loving the works of Uccello, Bosch, Brueghel, Goya, Hiroshige, Monet, Picasso—and excited by works created on a highly personalized basis, there is an impediment to perceiving that the artist's interest in technology is both profound and pervasive. Moreover, in this respect, the formation of an *organization* presumably to advance the cause of artists may strike one as antithetical.

These and other considerations led the founders of E.A.T. to formulate a philosophy of collaboration that strikes out questions of esthetics as much as possible. In their matchings of artists and engineers, they stress the process of collaboration and experimentation rather than the results a particular artist aims for; they aim at involving the artist with the relevant forces shaping the technological world rather than concerning themselves with the set of esthetic convictions that guide him. Consequently, just as all kinds of specialists are welcome under the umbrella of IEEE, so all kind of artists and engineers are welcome in E.A.T. The organization thus hopes for a rich growth through the avoidance of artistic cliques factions.

In its short career, E.A.T. has already assemble a list of remarkable achievements. It has attracted about 6000 members (including roughly 2000 engineers and 2000 artists) and made about 500 matchings in collaborative projects. It has organized about 35 local groups in the United States. Correspondent groups have been formed in Argentina, Australia, Brazil, England, France, Germany, Holland, Italy, Sweden, and Switzerland. In addition, E.A.T. has opened regional offices in Los Angeles and Tokyo, and a group in Canada is setting up a national group there. Moreover, E.A.T. has sponsored a competition and several awards for an *engineer's* contribution to a collaboration, with the jury drawn from scientists and engineers. Some of the works, which appeared in a major exhibition of all the entries at The Brooklyn Museum, are shown on these pages. One of the most recent projects undertaken is the orchestration of an international collaboration for Expo 70. By 1980, E.A.T.'s officers expect a $10 million operating budget, with several million going to the support of large-scale projects, and several million more going into services for artist and engineer members. Present support for the organization comes from the Rockefeller Brothers Fund, the National Endowment for the Arts, industry, and private individuals.

Experiments in Art and Technology can be contacted at 235 Park Avenue South, New York, N.Y., 10003. There has also been some thought about the possibility of forming an art-and-technology group within IEEE. Expressions of interest or concern sent to IEEE Headquarters might galvanize the issue one way or another.

A model for collaboration?

Despite the foregoing "advertisements," one must recognize that we have been describing pioneering experiments that have been going on in a rarefied atmosphere. We see nothing yet resembling the unity that prevailed in the fine and mechanical arts in centuries past. It is probably a fact that the art-and-technology movement at this time occupies the attention of only a minority of artists and undoubtedly an even smaller minority of engineers. Moreover, in terms of completed pieces in the art-and-engineering genre, there is not yet much to sing about; collaboration exists more in the realm of possibilities than actualities.

Thus, at this stage, unless one is inclined to condemn the idea of artistic and engineering collaboration outright, it is probably wise to focus one's attention on the process of collaboration. The sympathetic onlooker might say: let the experiment find its own limits and constraints; let it stake out its special territories through trial and error; let it grow as it will without worrying overly much about where specific works belong as far as esthetics or engineering are concerned. Nevertheless, in this situation, one might wish to know if there have been other collaborative situations that bear any resemblances to that of art and technology, and whether or not one can learn anything from an examination of such situations.

Two such parallel or analogous alliances come immediately to mind—the collaborations between engineers and physicians and collaborations between engineers and psychologists, both of which led to the organization of groups within IEEE (the Bio-Medical Engineering Group and the Human Factors in Electronics Group, now called the Man–Machine Systems Group).

Engineering's serious alliance with medicine began not many years ago, generally in the form of a collaboration between individual physicians and engineers. Some of these collaborations worked, some didn't; most were undersupported; and most resulted in various kinds of assistive instrumentation for physicians. (More deep-going, sensitive, and truer collaborations, as in the doctor–engineer developments of heart pacemakers and artificial organs, have really got going in the past few years.) However, it often turned out that the expectations of the physicians and the engineers were disappointed. The really complex systemic problems confronted by doctors, in which many interdependent variables had to be taken into account (if they were known or understood at all) would not yield to the kind of component engineering a single engineer might carry out in his basement in his spare time. Moreover, there were resentments polarizing around the question of who was to hold the governing shares in the partnership. The usual case in those days was that the doctor insisted, undoubtedly rightly (the patient's condition being his sole responsibility), that he was to have final say on equipment development. The medical position was that the engineer would never come to understand the medical problems in their true complexity. Thus, engineers who had been attracted to work that they felt had much social and moral reinforcement to recommend it (and who in some cases were deliberately moving *away* from work on weapons systems at the cost of sharp cuts in income) now found themselves in the sometimes frustrating role of mere servant–technicians. They felt injured by the subservient positions in which physicians held them, and insulted by their failure, in spite of their sacrifices, to be respected as true professional men. In any case, such collaborations, whether they failed or succeeded, sharpened questions about the nature of engineering professionalism. Who was the more professional? Was it the doctor, working alone and personally with individual patients, bearing the final responsibility for the success or failure of his treatment; or the engineer, usually working on a large coordinated team, and usually within the framework of a paternalistic industrial situation or establishment, on supersystems where the responsibility is shared out among many individuals? Or were the two situations really comparable? If the physical system (computer, missile, space vehicle, or what have you) or its components failed to meet schedule, or failed in performance, delivery or use could be postponed with consequences neither so severe nor disquieting as those encountered by a physician or surgeon.

Despite such issues and other subsequent arguments, however, the collaboration of medicine and engineering has steadily gained ground and adherents; financial and physical support, though never large, has increased and seems now about to take off to substantially greater levels; new biomedical engineering departments have been established at many universities; teams of specialists of all kinds from the engineering and life sciences have made real and impressive advances that would have been out of reach of engineers and doctors alone; and, of late, it has been possible to discern that biomedical engineering has begun to take on a character of its own. No longer pure engineering, no longer pure medicine, in the traditional sense, the field is claimed by some of its spokesmen to be no longer a hybrid. Although one still hears overtones of the old arguments and expressions of disillusionment, and complaints about communication barriers, biomedical engineers of the younger generation say that the integration is tacitly complete and that the biomedical engineering field is in the process of building its own scientific basis. The situation now, they often say, is that you pose the biomedical problem you wish to solve, and then you seek for the tools and methods, from engineering or medicine, wherever they may be, in order to solve the problem.

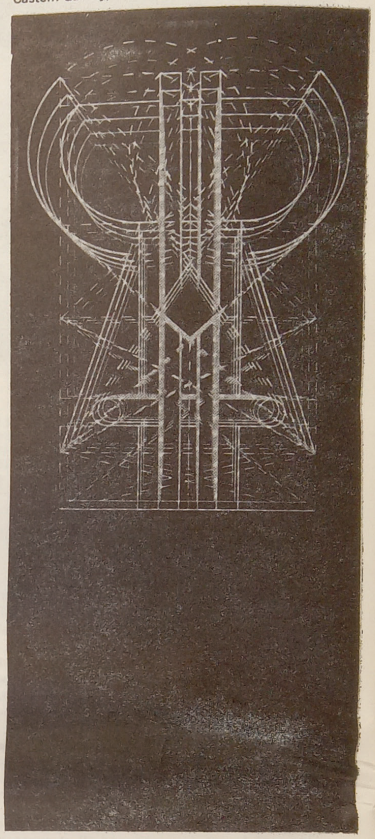
And in these tasks, life scientists, physical scientists, physicians, and engineers all work on a more equal footing.

A somewhat similar integration of psychologists and engineers is discernible in the field once called human engineering, then human factors in engineering, and now man–machine systems.

This brief description is not meant to minimize the difficulties that have existed and that still exist in the growth of such collaborations, but their example gives one a basis for projecting that some similar stages of evolution could come about in art and technology. The parallel can by no means be exact, however, or carried through to a trustworthy conclusion, especially as one begins to weigh the unique character and history of the artist in society.

It is only when one once again reassesses what is common knowledge—namely, that technology, in less than a generation, has moved to a central role in our society, and that *it* now holds a charismatic force, both magical and threatening, in the minds of most people; that technology occupies a position of authority the Church, the Monarchy, the State, once held—that the interest of artists in this crucial and governing phenomenon becomes more plain. The history of art shows that the artists worked off the tensions set up within society; artists created successively the powerful iconography for Church, for Monarchy,

"BARMECIDE," 1968, by Stanley Landsman, is a container with a light source, fixed images, and reflective surfaces that allow one to see the images out to infinity. The piece was in an exhibition, "Light: Object and Image," at the Whitney Museum of American Art. (Leo Castelli Gallery, New York.)



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and for social and humanist revolutions. The artists' interest in the instrument that has succeeded those entities seems, then, quite natural. It seems, in fact, to fulfill a requirement that Gyorgy Kepes spoke about at the dedication of the new Center for Advanced Visual Studies at M.I.T.—it answers "historical necessity."

Epilogue—some hard questions

As one considers the prospect of art and technology, there arise many questions that are perhaps unanswerable to everyone's satisfaction, but to which we all might give thought.

Is it art? There will be those who, nurtured on traditional modes of art (illusionistic painting and sculpture, a music made of notes, dance executed by people and not by objects, writing scaled on a sociological and psychological illusionism), will find that the emergence of art grounded in technology causes feelings of pain. Works that move, light up, buzz, whir, that are ordered by the artist from a factory, music composed of whistles, rumblings, industrial noises, and long silences, and so on, may arouse repugnance, suspicion, incredulity, discomfort, hostility, and rage—in short, a spectrum of feelings that might be expressed by the formula: "But do they mean to call that stuff *art*?"

Although we must abide here with little more than the observation that the art of this century has undergone successive radical transformations, it may be amusing to note that art critics, too, sometimes share the sentiments of the "great unwashed." O'Doherty, for instance, in his collection of insightful essays, writes that there is a "deep unease among critics, historians, and some artists as to what art is all about—a more difficult problem than usual nowadays when anyone with any honesty has to admit he just doesn't know."[2] There is no dearth of "explanations" about what is happening. A recent work by Jack Burnham, *Beyond Modern Sculpture*,[6] probes the reasons behind why sculpture has undergone such radical transformations. Burnham, trained in both art and engineering, stresses the transfiguring role of technology in moving sculpture away from its traditional, inanimate craft-oriented modes and toward its replacement with life-simulating systems through the use of technology. Another recent work, *The Science of Art*,[7] by Robert Mueller, an engineer turned artist, takes a cybernetic-oriented look at the relation of art and science. *In Against Interpretation*,[8] the collected critical pieces of Susan Sontag, one can read a provocative and persuasive "interpretation" of the thrust of recent artistic events, especially as they center about New York. To catch the lyric voice of one of the major influences of these events, one should read John Cage's recent book, *A Year From Monday*.[9] One can trace the roots of modern artistic interest and concern with new materials, real objects, machines, and so on in W. S. Rubin's *Dada, Surrealism, and Their Heritage*,[10] which includes a good treatment of such artists as Max Ernst and Kurt Schwitters. Serious students of the engineering-and-art phenomenon of our century will wish to study the *Vision + Value* series of volumes[11] edited by Professor Gyorgy Kepes of M.I.T., as well as his landmark book, *The New Landscape in Art and Science*.[12] When it was published in 1956, Kepes says, some art magazines refused to review it because they said that art and science were unmixable entities.

These books represent just a sampling.

What's in it for me? This is perhaps the crucial question that the engineer will ask, and it really ought not be answered on the intellectual level. The best answers will come only after the engineer actually engages in a project with an artist. Essentially, the message here is that an artist has a lot to offer an engineer (and his industry) if the engineer just keeps his eyes open and learns how to translate the artist's message.

As he reflects on it, an engineer may discover many reasons for *not* concerning himself with artists and their aims: Such projects may seem silly, gimmicky, useless, difficult, unrewarding, child's play, a waste. It may seem, too, that it would take a stroke of luck to find an artist with whom one would be compatible in a working relationship.

The most respectable reasons are that at the level at which the artist perforce encounters science and technology it is likely that the technical problems will not be exciting enough to engage the engineer's interest; moreover, any engineer worth his salt is likely already expending all his time and energy on a project to which he is committed. Likewise, for the industrialist who considers giving support to artist–engineer work on company time on artistic projects, the prospect of an interesting return, other than a vague and intangible prestige, may seem marginal.

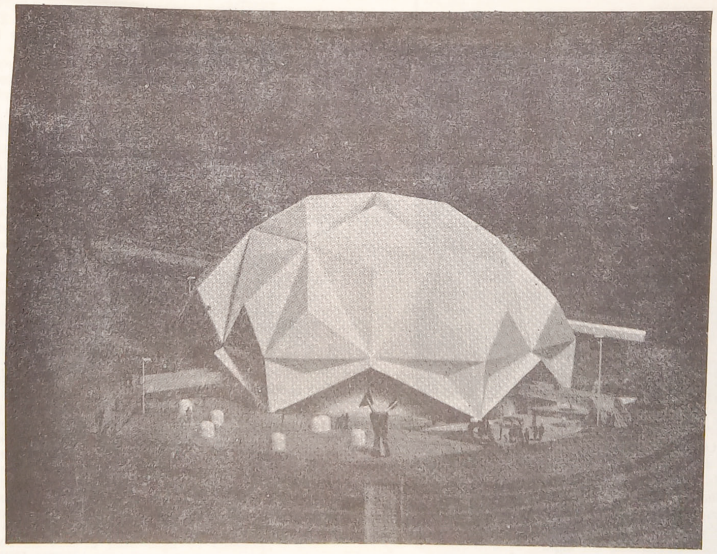
Despite such possibilities, however, collaboration has many appeals, which Klüver has pointed out on numerous occasions: new types of people to work with; new horizons of ideas; a different way of looking at engineering; the satisfaction of carrying something through outside of the goal structures of a profit-making organization, and the accompanying sense of special responsibility that one may miss in a usual engineering team effort; the opportunity to learn about art at first hand; the opportunity to learn how artists may work differently from engineers; and the contrary experience, finding out how much the techniques and processes of art and engineering may be alike.

One of the most serious and most intriguing possibilities is that engineering and engineers will find brand new goals. Engineering goals have never been fixed; in its deepening interaction with society, modern technology has had imposed on it new goals—Cold War systems, space systems, biomedical investigations—and it undoubtedly will continue to find new goals, as in transportation, and in ways of confronting the urban crises. The promise that art holds for engineering in this respect seems strong indeed.

In the clutch, however, each engineer must find his own unique answers. Engineer Fred Waldhauer, for instance, who participated in the 9 Evenings and in other collaborations, says that he got over his idea that art was a "precious thing," and that he felt "freer" as a result of his close association with artists. He feels that artists "take more chances" in their search for limits, and that they do not seem as daunted by the possibility of failure or of adverse criticism as are engineers. Moreover, the artist and the engineer working with him learn to tolerate a higher level of uncertainty. Rauschenberg, too, stresses this point: in any really critical important development, he feels it is important to give up ways of working in which you have been comfortable. To enrich one's environment and one's life, one must take risks. This is why the more arduous and difficult path of collaboration is preferable to the artists' mere exploitation of the given technology. As Waldhauer puts it, "If the artist and engineer understand one another, then the artist can use the *real* technology rather than just using it as a found object."

Engineer Leonard Robinson, with a long career behind him in systems engineering, says that although he paid little heed to art during his engineering career, he found that in collaboration he was "turned on" for the first time in his life. It is clear from his interviews and writings that he was extraordinarily impressed by the character and the commitment of the artists with whom he worked—"they were beautifully patient, believing and understanding." Robinson says of the 9 Evenings that if from the engineering point of view, they were "crude and the results imperfect, this should encourage other engineers and artists to come forward to improve upon that which was started. When they do this, the real purpose of the 9 Evenings will have been realized."

Finally, many of the engineers who collaborated exclaim over the unexpected fun of working with artists—the sheer joy of the enterprise—which, after all the practical, ethical, philosophical, and other lofty reasons and arguments are weighed, seems like the most sensible and satisfying reason of all.



AT EXPO 70 in Osaka, Japan, an International collaboration between six artists (four U.S. and two Japanese), four assisting artists, and 12 engineers, will design a unique environment for the Pepsi-Cola pavilion shown here in a model. The dome structure, to be surrounded by a persisting "engineered" cloud, will house a 28-meter-diameter spherical mirror. Through the use of complex optical, sound, and radio effects, the visitor will be able to move freely through the pavilion to find different sensory experiences as he chooses. E.A.T. is administering the design and construction of the pavilion and is orchestrating the work of the collaborating artists and engineers.

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RAT, JUNE 12, 1969 EXCERPT

THEATRE AND THINGS

BY BRUCE GRUND

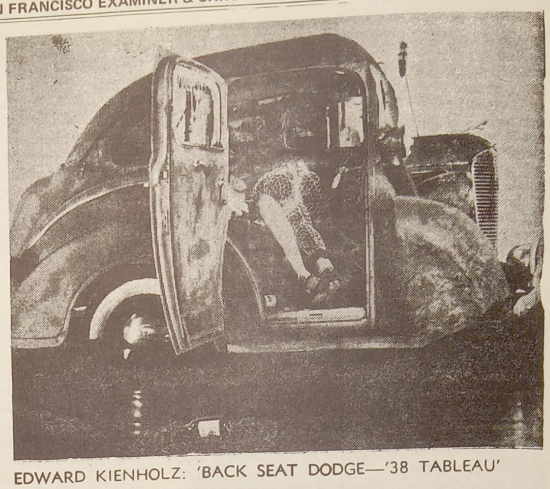
Art

Also in the Jewish Museum at the same time as "Now Sound From the Middle East" has been some very hip modern art. The first was the "Laser:Beam:Joint" by the young Japanese artist Keiji Usami. The work incorporated five green acrylic panels, two lasers, one red and one green, black light and smoke, in a process which, according to Mr. Usami "treats space itself as a kind of structure." "Laser:Beam:Joint" is installed at the Jewish Museum in collaboratoin with Experiments in Art and Technology.

The full effectiveness of "Laser:Beam:Joint" was achieved only when the environment was entered by the spectators, who set up an interaction between the human body and the components of the work, since a laser beam is cut off at the point of contact with a solid object. When "Laser:Beam:Joint" was shown at the Minami Gallery, Tokyo in 1968, visitors customarily walked through it. For the exhibition at The Jewish Museum, the Board of Health has ruled that the work must be viewed from behind a glass partition. However, the night I as there, Keiji Usami was there too and invited me to walk through and I did several times. Had a ball doing it, intercepting the laser beams with my body, my hands, my feet and my head. The only real danger was to the eyes, which was easy avoidable, once you have been made aware of it. I must've broken the ice (that night anyway) because after me a flock of other people walked through with curiosity and enjoyment.

Most of the stated information on "Laser:Beam:Joint" and "Interfusion" was taken verbatim from the excellent press releases of Herbert Bronstein, Public Relations Consultant at The Jewish Museum. For more information, phone: RI 9-3770, ext. 392.

SAN FRANCISCO EXAMINER & CHRONICLE, JUNE 22, 1969 EXCERPT



EDWARD KIENHOLZ: 'BACK SEAT DODGE—'38 TABLEAU'

The Artist and the Machine

"THE MACHINE as Seen at the End of the Mechanical Age," a huge survey ranging from a replica of Leonardo's flying machine to the latest kinetic, electronic and computer art, will open Friday for a two-month run at the San Francisco Museum of Art.

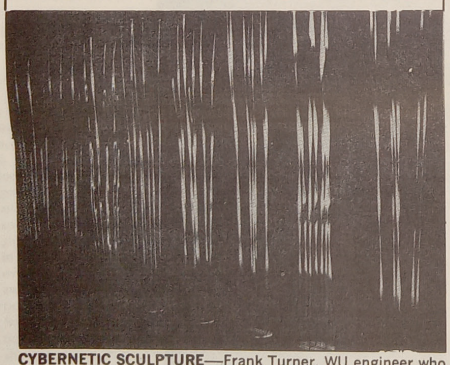
The show, which drew record crowds to the Museum of Modern Art in New York last December, outlines of the artist's perennial love-hate relationship to the machine through more than 200 works.

The show will include recent works created under the sponsorship of E.A.T. (Experiments in Art and Technology), marking the transition of the so-called machine age into a new era of electronic technology and collaboration between artists and engineers.

"Homage to Energy," an event by local E.A.T. members in cooperation with Pacific Gas and Electric Company, will take place outside the museum during Thursday preview night, launching a two-month program of related events, films, lectures, and concerts.

WESTERN UNION NEWS, JUNE 2, 1969

Science Blends With Art



CYBERNETIC SCULPTURE—Frank Turner, WU engineer who retired last fall after 22 years of Company service, recently was awarded a $1,000 second prize by Experiments in Art and Technology, a New York organization involved in the interactions of artists and engineers, for his engineering contribution to artist Wen-Ying Tsai's work shown above. The piece is composed of nine-foot-high stainless-steel rods illuminated by stroboscopic lighting. The display picks up sounds from any source, (voices, for example) and springs into shimmering, graceful movements. The "sculpture" was recently on exhibition at the New York Museum of Modern Art and is now on a cross-country tour of several cities in a program called "The Machine as seen at the End of the Mechanical Age." Though retired, Mr. Turner still serves as a consultant on WU's Bomb Alarm system, a government defense program he worked on since its inception in 1958.

NEW YORK TIMES, JULY 13, 1969 EXCERPT

TESTING

E.A.T. (Experiments in Art and Technology) is going full steam ahead (you should pardon the old-brain expression) with its design for the Pepsi-Cola Pavilion at Expo '70, the World's Fair that opens in Osaka March 15. And don't—given E.A.T.'s artist-engineer alliance — expect anything, well, *retardetaire*.

Rearing its white dome amid a bank of programed clouds, the pavilion will boast such attractions as a 90-foot, walk-in spherical mirror, a heliophilous structure that tracks the sun's course, a cluster of sculptural "floats" that glide around the Expo plaza making friendly noises.

"It's a software idea, like the whole fair," explains Billy Kluver, E.A.T.'s peripatetic director. "At the old-style hardware fairs, people used to go and look at products,—say, sewing machines. Now it's process—they'll be given a chance to create their own thing."

The Pepsigoer, equipped with a handset that picks up "sound experiences," won't lack for fun and games inside. Showered by light from a Krypton laser beam, he may make his way up to the mirrored dome, where he'll catch himself as a series of cleverly altered images. He can also "compose" his own sensory experiences by walking on the sectioned floor, each area of which provides a different charge (one bouncy section, for instance, makes noises when jumped on). Activated by floor loops, the handsets will broadcast on their own—rock music, nature sounds, outer space static. When they are turned off, the dome's over-all sound and light program takes over. Oh, and to compound the totality of it all, there'll be "live" performances—music, theater, dance, children's programs.

Three branches of E.A.T. (N.Y., L.A. and Tokyo) have been working on the $2.5-million pavilion's design since last August, when E.A.T. agreed to administer an "experimental collaboration" between artists and engineers. The project, E.A.T. stresses, was undertaken "not as a work of art, but to enlarge the scope of artist-engineer collaboration to new areas of artists' involvement and experimentation in the environment." "The most impressive thing is that we were able to establish rapport not only among American artists and engineers but with the Japanese groups as well," says Kluver. "Each submerged his own ego. If it's successful, it's a whole new way of doing large projects."

(Note: Tight space prevents a listing of the artists' and engineers' names. Teamwork is teamwork, anyway.)

PACIFIC GAS AND ELECTRI

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NEW YORK TIMES, JULY 19

Lunar

BY WILLIAM
Times Staff Write

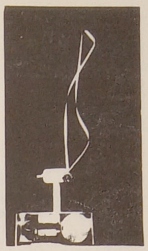
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PACIFIC GAS AND ELECTRIC COMPANY, JULY 1969

ELECTRIC ART



Technology Opens New Worlds to California Artists

IT MAY be a while before extension cords replace picture hangers in the average household's art collection. But electric art and similar new departures are already well established in local galleries and their influence is bound to spread.

For instance, visitors at the opening of a current show at the San Francisco Museum of Art were welcomed by a pattern of PG&E street barricades and half a hundred yellow flashers blinking in urgent profusion. The unusual entryway exhibit was created because it symbolized the role that electricity—and gas—are playing in modern "plugged in" art.

In fact, so large is this role that the museum had to beef up its power supply in order to stage the show. Called the Machine Show, it is a New York Museum of Modern Art collection of works in which many pieces use sound, light and motion as a medium.

Laser beams, photoelectric cells and computers; plastics, gases and sophisticated electronic circuitry—all are being explored by musicians, sculptors, painters and other artists today. To help them in these new mediums, a world-wide organization called Experiments in Art and Technology has been formed.

"We bring together people from science, technology and the arts and what will come out of this may be something entirely new and certainly exciting," says Merlin Stone, E.A.T. Bay Area coordinator. "With the use of energy artists can add a fourth dimension—time—to works that previously had been three-dimensional."

Thanks to technology, arists in many cases are adding something else to their works: the viewer. A Berkeley professor has done sculpture that responds when someone walks into the room; a Kansas City show featured a "garden" of columns that produced light, sound and wind actuated by the viewer as he strolled among the pillars.

Art and technology programs that will allow students to work with new materials and processes are being set up in Bay Area colleges and universities. Eventually, E.A.T. hopes to have artists working in industries with engineers and scientists and, together, approach technological developments in new ways to benefit both the industry and the art world.

Anticipating the astronauts' landing on the moon, Miss Stone last month was investigating a suggestion to beam a light show to them with laser beams—technically quite feasible.

NEW YORK TIMES, JULY 1969

Lunar Walk Hailed at Art-Science Fete

BY WILLIAM WILSON
Times Staff Writer

Reality seemed to overtake the wildest dreams of art last weekend. Maybe that is why the joint ar-science moon landing celebration at Caltech Friday evening felt more lik a medieval carnival than a scene from the movie "2001."

Several hundred moonstruck souls came to Pasadena to watch. They ranged from shell-oxford academic-romantics to thrift-shop art-romantics. For nearly three balmy hours all enjoyed searchlights, acrobats, movies, laser beams and a notable number of works made wih white balloons, bringing the total of visible moon-images to about 20. If the real moon was out it got lost in the shuffle.

The crowd screeched and ran happily as David and Bernard Tanner bounced men a couple of stories in the air, strapped to a big helium-filled membrane used to simulate reduced gravity.

All probably felt something in common with the group of grammar school kids who displayed imaginative space constructions, extra-bright children learning to be creative in foil-wrapped football helmets and Levis. They dream of space as did the children who made the film, "The Seventh Voyage of the Super 8," at Barnsdall Park's Municipal Junior Art Center. Their teacher, Lauren Rickey, screened it to the Beatle's "Lucy in the Sky With Diamonds."

We were all like kids that night, dreaming, while thebig people were out there doing it. Apollo got the moon. We retrieved our sense of wonder.

Compared to the dust-mote of efficiency of Apollo 11, the Caltech gesture was all pleasant, poetic. Billie Burke disorganization. Sponsorship came dually from Caltech and E.A.T. (Experiments in Art and Technology), a New York-generated project formed by artists dissatisfied with the limitations of traditional artistic maerials. EAT has fostered successful collaborations in the East, seems slowly to be producing results in California.

Friday some of the heavier announced artists couldn't make it (Sam Francis, James Turrell, Judy Gerowitz). A major piece by UCLA sculptor-professor Oliver Andrews seemed fated never to get off the pad. The program had neither schedule nor coffee truck. Yet it added up to a dreamy, if thirsty, kind of fun that was nothing if not moony.

A rare Krypton laser drew the greatest number of gasps for sci-fic mystery, spectacle and tittilating potential danger. (That beam can cut through solid steel. don't look straight into the beam—blinding.)

Loaned by Palo Alto's Coherent Radiation Lab, it generated thin intense tubes of pure colored light. as I get it, a single beam is unscrambled, through a prism, into multi-tubes, each a single dye-bright prismatic color. they appear solid, sometimes metalic, utterly straight, and, flashed into the sky, infinitely long.

Laser Display

The laser display was directed, jointly by the evenings art coordinator Ruth Baker, Desmond Armstrong and Caltech's coordinating engineer, Elsa Garmire, a tall, enthusiastic art buff who bustled through rays in a gold lame jump suit.

Artists liked the laser's stright line configurations, maybe because they recall the paintings of Morris Louis. Engineers liked mixing the beams into webby patterns.

"Looks like late abstract expressionism to me," said artist Craig Kauffman. "Maybe that wiggly stuff looks more like art to a scientist."

Art's most elaborate and popular offering was the joint venture of Pasadena art-patron-turned-artist, Barbara Smith and artists Ann Ferrier and Joseph Byrd. Their "piece," as they are familiarly called, consisted of a long corrodor of parallel 50-yard white cloth banners, projected lunar slides, eerie electronic sounds and pert-young acrobats whose tumbling looked extra-terrestrial in motion-stopping strobe lights.

New York dancer Steve Paxton lay motionless at the bottom of a deep cement stairwell for his "Dance." He wore solid blue, was illuminated by a spotlight and blinked occasionally to recordings of "Moonlight Sonata" and "Moonglow." The piece, clearly left open to interpretation, had elements of underplayed satire.

Sculptor Lloyd Hamrol launched an arc of tethered white balloons, somehow illuminated from inside. Hamrol's art recently verging on invisibility, is inclined to get lost in groups. One felt this gentle offering could only have been properly appreciated presented singly in some dark meadow.

Oliver Andrew's plagued project finally floated, almost crashed, late in the evening. Several perlescent white Shmoo-shaped balloons trailed tentacles of silver mylar. It was a notably elaborate, Baroque object in a science-spare presentation. It managed to be a gratifyingly Barbarella-like evocation of foreign galaxies and those imagnined moon monsters now probably forever discredited by Apollo 11.

'Magnificent Landing'

"I mean, I think the landing is magnificent and all," said a pretty student. "It does kill a lot of dreams though, green cheese and men in the moon.

"The orientals can see the cosmos in a rock. Practical American dreamers have to satisfy their sense of magnificence by turning the moon into a rock.

"The only thing that really worries me is my horoscope. I'm a moon child. Is that landing going to louse up my karma?"

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