

by Dr. Goéry Delacôte,
Executive Director

In 1968, Dr. Frank Oppenheimer proposed the creation of a science museum and exploration center, where people could learn about science and technology by "controlling and watching the behavior of laboratory apparatus and machinery." In 1969, he realized this dream by founding the Exploratorium, a unique participatory museum.

Over the past 22 years, the Exploratorium has become internationally known for its innovations in exhibit design and science education. Today, the Exploratorium has over 650 interactive exhibits where people can experiment, raise their own questions, and discover the answers. Around the world, museums have emulated the Exploratorium's interactive style of exhibit building.

In 1991, when I accepted the position of Executive Director at the Exploratorium, I felt that this museum was already the most original science museum in the world. Over the coming years, I hope to help it make a major impact on the general problem of science education as well. The challenge we face is to encourage the public to understand and appreciate their world, to attract talented young people to science, and to provide new ideas for the teaching of science.

Over the past few months, I have been working with Associate Executive Director Dr. Rob Semper and other members of the Exploratorium staff to meet this challenge. We have considered both the concepts underlying the Exploratorium and its exhibits and the organization of the museum.

Focusing on cognition

Since the Exploratorium's inception, the museum's exhibits and programs have focused on human perception: how do we see, hear, smell, feel, and otherwise experience the world around us? It is natural to expand that focus, going beyond perception to include all of cognition—in other words, using the mind to understand the very workings of the mind itself.

The questions that the study of cognition poses are basic human questions of how the mind works and interacts with the world. It is a fantastically rich and multi-disciplinary field that incorporates everything from physics to linguistics to neuroscience to statistics to art to cultural anthropology. It is my hope to make the Exploratorium a bridge that connects the general public with the latest in cognitive research in a lively and engaging way.

This focus on cognition will include the museum's art exhibits and programs, as well as its scientific content. There are cognitive aspects of art, just as there are aesthetic aspects of science—and the focus on cognition reveals the overlap between the two disciplines. At the same time, both artists and scientists provide windows of understanding and experience of the world around us. An exhibit like Ned Kahn's *Tornado* can be looked at from an artistic point of view as well as from a scientific point of

view. As a result, the exhibit has both a degree of depth and a sort of openness which attracts a very large audience. For these reasons, the place of art in the Exploratorium will remain central.

Establishing three centers

The Exploratorium's shift in conceptual focus will be accompanied by organizational changes. To address the crisis in science education, the Exploratorium will expand its role as a center for exhibit-based public education, assume a leading role for science learning and teacher training, and become a center for interactions between science and the media. To accomplish this, we will create three centers within the museum: the Center for Public Exhibition, the Center for Teaching and Learning, and the Center for Media and Communication.

The Center for Public Exhibition will focus on the Exploratorium's already rich learning environment. At the Exploratorium's exhibits, people are encouraged to raise their own questions and to search for answers in a social way—speculating with friends and family about possible answers. Through the resulting discoveries, they construct their own knowledge of the world. Through the Center for Public Exhibition, the Exploratorium will develop exhibits that relate to cognition, challenging visitors to further examine the ways in which



Explainer Michael Jones and Director Goéry Delacôte. The Explainer Program is one of the programs that will form the core of the new Center for Teaching and Learning

they think and learn, remember and forget. In addition, the Center for Public Exhibition will continue to develop exhibits that fit into the museum's existing themes, with a special emphasis on additions to our exhibits on modern aspects of life sciences.

The Center for Teaching and Learning will expand existing programs for the in-service and pre-service training of teachers and other educators, stressing the interplay between informal and formal approaches to science. The Exploratorium makes use of an informal approach to science. In school, students usually learn a more formal approach to science, which focuses on learning facts and working quantitatively. The best scientists combine these two approaches, gaining an overview on a problem from informal investigation and exploring further with rigorous formal examination. Through the Center for Teaching and Learning, the Exploratorium will work to help bring about a blending of the informal and formal approaches.

The Exploratorium's third center, the Center for Media and Communication, will focus on the national dissemination of the Exploratorium's approach to learning. Traditionally, educational programs are disseminated by creating products—books, videos, pieces of software—and distributing them to teachers. The Exploratorium is interested in distributing a way of thinking, a process rather than a product. The challenge will be to use whatever communication tools we can to promote this learning process.

The Center for Media and Communication will make use of both mass media and one-on-one forms of communication. We plan to create a multimedia laboratory designed to foster the development of new learning tools that combine computer, video, and audio technology. Plans in this area include Exploratorium-based public

television programming, an international workshop focusing on video, CD-ROM, and other new media for communication, and a "scientist of the month" series, in which eminent scientists meet with middle-school and high-school students. This last program will open a much needed link between scientists and engineers in the laboratory and young people, giving students direct contact with an expert who offers a certain way of thinking about the world.

Moving into the future

To provide the framework for the Exploratorium's future growth, we are initiating an eighteen-month strategic planning and program development process. The goal of this process is to create a detailed plan for the institution's next four years and a more general plan for the next ten years. The planning process will consider the immediate space needs of the Exploratorium, financial and organizational support issues, and other aspects of the museum's programs, facilities, sources of revenue, and budget. This process, which will involve the museum's Board of Trustees and staff, aided by outside consultants, is designed to foster the creation of a fully articulated new Exploratorium, a "public university" capable of meeting the educational demands of the twenty-first century.

In 1968, when Dr. Frank Oppenheimer proposed the Exploratorium, the nation faced a crisis in science education. Today, science education has once again taken a center stage in the nation's consciousness. In 1991, the Exploratorium is poised to continue and expand its role as the innovative leader.

About Dr. Goéry Delacôte

Dr. Goéry Delacôte is a renowned French scientist, science educator, and public servant. He

joined the Exploratorium as Executive Director in February 1991. His accomplishments in science and science education include: the direction of a French national project that completely revised the approach to teaching physics, chemistry, and technology in France's middle schools; the assembly of a scientific team to create La Vilette, a national science and technology museum for France that opened in Paris in 1986; the establishment of an international workshop on physics education research at the University of Paris; and the Chairmanship of the French National Institute for Pedagogical Research.

For the last eight years, Dr. Delacôte has been the Director of the Science and Technology Information Department, one of eight scientific divisions of the Centre Nationale de la Recherche Scientifique (CNRS), France's leading primary scientific research organization. In this position, he was responsible for the creation, design, and implementation of a private publishing company and subsidiary of the CNRS, which released 200 new titles annually, and of the Agency for Scientific Communication, a center for publications, films, and audiovisual materials, broadcasting and distribution, exhibit design and traveling exhibitions. He also was responsible for the creation of the INIST Group, an organization similar to the American National Library of Medicine. The INIST is a highly computerized scientific information document delivery and databank center. As part of this project, Dr. Delacôte oversaw the design, construction, and completion of a \$100 million facility for the INIST Group.

Dr. Delacôte holds a Ph.D. in Physics from the Ecole Normale Supérieure in Paris, under the supervision of Professor Pierre Aigrain. He is a Professor of Physics at the University of Paris, currently on leave.

Weekend

The New York Times

Nature's Forces Unleashed, in Miniature

By ANDREW L. YARROW

Odd things are happening at the World Financial Center. Tornado clouds are rising, pendulums are wildly twitching, electronic flowers are blooming, and voices and faces are being distorted beyond recognition.

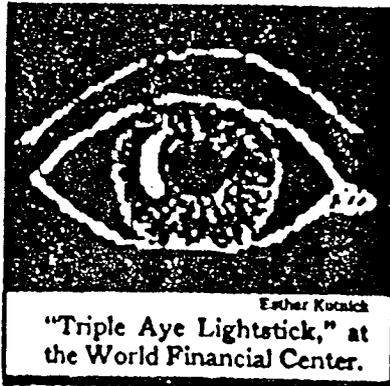
This mayhem amid the glistening corporate towers of Battery Park City is part of a free 10-week exhibition called "Art From the Exploratorium," which combines science, art and playfulness. The show, which opened yesterday, includes 20 interactive artworks from the Exploratorium science museum in San Francisco. Using sophisticated technologies and a substantial dose of humor, the works explore natural phenomena and the processes of human perception. These quirky creations — which invite visitors to touch, manipulate and ponder — are dotted about the public areas of the Financial Center, and are the latest project of its Arts and Events Program.

In the indoor courtyard between the Merrill Lynch and American Express buildings, for example, two large parabolic dishes beckon passers-by to think about the nature of sound waves. These so-called "Listening Vessels," created by the sculptor Doug Hollis, focus sounds so that someone sitting in one dish can hear someone whisper in the other dish, 75 feet away. In a nearby work called "Silage Beach," by Mowry Baden, the illusion of motion is created when one stands inside a tent of rotating orange-and-white flaps. And the "persistence of vision" is illustrated by Bill Bell's "Triple Aye Lightstick," a contraption that seems to make words fly through the air.

Fooling Oneself

A basic concept of these artworks is that, "by fooling our perceptual mechanisms, we learn a lot about how they work," said Peter Richards, the director of the Exploratorium's art program and the curator of the exhibition.

"Playful discovery is an activity common to artists, scientists and



Esther Kucack
"Triple Aye Lightstick," at the World Financial Center.

Science and amusement merge in 'Art From the Exploratorium.'

children," Mr. Richards said, explaining the philosophy of the exhibition and the museum. "We encourage that kind of playful experimentation, which is what precedes any successful artistic and scientific activity."

The Exploratorium was established by Frank Oppenheimer, the eminent nuclear physicist, and opened in 1969 in the Palace of Fine Arts in San Francisco. It was conceived as an interdisciplinary museum of science, art and human perception, and was a pioneer in developing interactive exhibits.

Sandstorms and a Tornado

The nature of nature is explored in several works on the balcony surrounding the courtyard. Undulating wave patterns are evoked by Ward Fleming's mechanized sea of tiny pendulums called "Vibrating Pin Screen," while sandstorms engulf a glass-enclosed desert in Ned Kahn's "Aeolian Landscape." Not far away, in Mr. Kahn's "Tornado," wisps of fog are mysteriously transformed into a swirling vortex that suggests a twister cloud. Another of Mr. Kahn's creations is a giant sea-blue crystal ball called "Turbulent Orb." The

work was "inspired by photos of the Earth from space, and tries to capture the feeling of floating atmospheres," he said.

It's anything but natural, but "Flora ex Machina" pays "homage to what nature does best," said the artist Christian Schless. His twirling neon garden of what he calls "cyber-flowers" impressionistically traces the life cycle of a perennial plant every 45 seconds.

Several other works probe the workings of the senses. Inside a pair of wooden phone booths — actually a work by Paul DeMarinis named "Alien Voices" — "callers" may choose from among 16 options to electronically transform their voices into songs, monotones, Gregorian chants and otherwordly utterances. A few steps away, at a computer-assisted video camera and monitor that constitute Ed Tannenbaum's "Discernibility/Going to Pieces," visitors may decompose or freeze their own facial expressions by manipulating the spatial and temporal resolution of the images.

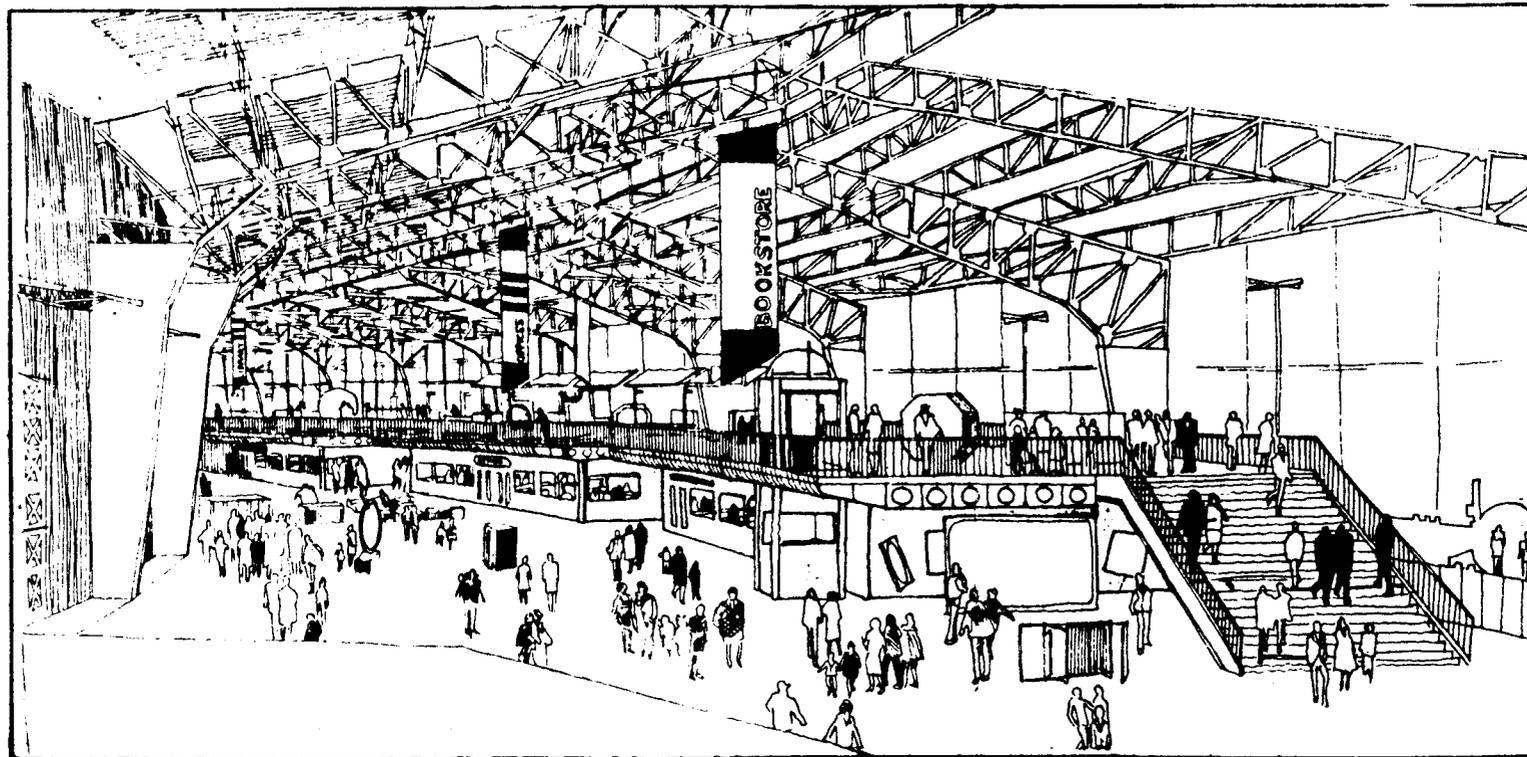
The intersection between art and technology is nowhere more evident than in Richard Greene's "Light Strokes." With the help of an I.B.M. computer, a video camera and a palette of 4,096 colors embedded on a microchip, one can paint on a glass screen and see the digitally transformed images appear on a monitor that acts as an electronic canvas.

And for those who want to visit the Exploratorium's home city, the next best thing to being there is Hill Branscomb and Michael Naimark's "Golden Gate Bridge Videodisc." Making use of aerial scenes shot along a dense grid pattern above San Francisco, this make-believe flying machine allows one to traverse a 100-square-mile swath of the Bay Area.

"Art From the Exploratorium" can be experienced on weekdays from noon to 7 P.M., and on weekends from noon to 6 P.M., through April 18. The exhibition area may be entered from Vesey Street (near West Street) or the north bridge from the World Trade Center. Information: 945-0505.



The exhibits are arranged poetically, without systematic order



Plans call for a one-story structure, with observation platform, running down the center of the hall

Environmental Design

The Exploratorium's Marriage of Art and Science

By Allan Temko
Architecture Critic

In a city that prides itself on elegant reuse of historic buildings, the most magical recycled space in San Francisco is the scruffy, forever unfinished Exploratorium — flickering with strange sounds, wondrous with illusions that turn out to be true — in the cavernous interior of the Palace of Fine Arts.

It's a masterpiece of improvised, poetic environment.

A benevolent wizard presides — the 66-year-old physicist Dr. Frank Oppenheimer, who is almost equally at home in the fine arts and music, literature and philosophy, as he is in pure and applied science.

Like Oppenheimer, the Exploratorium gently defies strict categorization.

It was Oppenheimer who coined the name "Exploratorium" — even though he frets over hybrid terminology — because no existing designation fits his unique institution. He, of course, doesn't consider it an institution at all, but rather a constantly evolving interplay of people and ideas, in which thousands of individuals participate, no matter what their age or social background, on a free and even basis.

Architecturally, each of the 425-odd exhibits is a separate work of art, created by a single individual or by a few working together. There is no systematic order between exhibits, no compulsory sequence. One

finds one's way within the giant enclosure of the Palace of Fine Arts much as one passes in darkness from one tactile chamber to another beneath a 32-foot geodesic dome that simply seems plunked down in the great space.

Thus it's not a "science museum" in any traditional sense, and still less a school. No one has ever flunked, Oppenheimer remarks with a smile, at the Exploratorium.

Rather — and this is the key to its spontaneous, unorthodox, unintimidating design — it's a place where science and humanism, art and technology, happily coexist in a somewhat topsy-turvy, random pattern.

Here the young and old, highly educated or barely

literate, may learn by *perception*, illustrating *principles* by their own acts. By tossing a red ball, for instance, into an air stream emerging vertically from a blower, and seeing the ball settle in space, they immediately understand Bernoulli's theorem.

By arranging slanted wooden blocks on a horizontal diagram of Eero Saarinen's colossal Jefferson Arch in St. Louis, and then raising the blocks and letting them stand, someone who has never heard of structural engineering can suddenly grasp the formidable strength of a catenary curve. And this is only part of a group of displays showing the development of exponential forces and forms, of which the arch of stainless steel is one.

The method is everywhere enriched by broader aspects of humanism. In a handsome white kiosk (one of the few seriously *architectural* presentations) the wry drawings of Saul Steinberg demonstrate principles of statics and equilibrium.

What makes such exhibits more astonishing is that, although they appear strewn haphazardly, like an experiment in probability theory, they somehow form a consistent, coherent, vivid entity.

It's true that related displays are grouped under headings such as "Light" and "Color" (behind the Steinbergs, for instance, Seurat's *Grande Jatte* and an Albers' *Homage to the Square* illustrate color theory). Yet it takes some time to realize that this lightly connected field of information is united by something more than chance.

The powerful unifying force is a shared idea of genuine culture. An exquisite light-wave sculpture by an artist-in-residence from M.I.T. is joined with the extraordinary transparent smoke-chamber by another light sculptor (who drives a truck in the East Bay to support herself); points of light are translated into radiant planes or shining bars that merge and disengage in a microcosmic dance.

It is all part of a process that can be understood. Off to one corner is a large and, I must say, wildly disarranged shop, with machines, tools and materials about, where most of the exhibits are made and often re-made, as ways are found to improve them. Usually the work is done by the inventors or designers themselves, each with a separate esthetic, but all speaking a universal scientific language. They include professionally trained scientists and engineers, as well



A boy learned firsthand how a ball can settle on an airstream coming from a blower

as painters, sculptors, glassmakers, and maverick creative types from all sorts of technical and non-technical fields.

All this goes on in view of the visitors, who can wander past as they wish, or else be guided by one of the 40 high school and college students who serve as part-time "explainers," if explaining is wanted.

But it raises the question—it could be called the riddle—of the great surrounding enclosure of Bernard Maybeck's Palace of Fine Arts.

What does the lordly romantic stage-setting of the burnt-orange dome, the sweeping Michelangesque colonnades, the sentimental Beaux-Arts sculpture, have to do with science and reason?

By strict modernist theory, the ornate temporary buildings of the Panama-Pacific Exposition of 1915-1916 were false, flagrantly irrational architecture. Their cast plaster shells, like pastrycake, concealed and distorted the internal structures of steel. This was compounded when the whole Arts complex, saved by popular demand after the rest of the Exposition buildings were destroyed, was permanently rebuilt in concrete in the 1960s.

The superb rotunda and colonnades, moreover, masked the immense curving shed behind them: that is, the "Art Palace" proper, spanned inside by arched trusses 136 feet across and 50 feet high, which had been the luminous skylit gallery of the Exposition.

In this immense space, 1000 feet long, the works of Picasso, Matisse, and other revolutionary modernists had been first publicly shown in the West, in wonderful airy rooms covered with unbleached muslin to temper the brilliance of the light.

Maybeck, like legendary gardener John MacLaren who laid out the gardens of the Palace, was above all an individual who stood first and last—in Lewis Mumford's splendid phrase—for "the primacy of the person."

Oppenheimer does, too. On this principle, within a decade after the city hesitantly made most of the building available to the Exploratorium in 1969, he has created for all of us, with only meager public funds and slender private support, something so valuable that a price cannot be put on it, as it could on Pier 39. More than half a million people come each year to fathom the wonder of things.

The Exploratorium—still without an admission charge—now has all but \$140,000 of the \$750,000 it needs for its first large architectural improvement. Characteristically, the program is modest, a bit undecided while Oppenheimer and his youthful associates decide what best to do.

Basically the thoughtful design by McCue Boone Tomsick (with Peter Hockaday as project architect) calls for a one-story structure running down the center of the hall in which the bookstore and a few other presently unsheltered activities will be put under cover. The deck above will be an observation platform overlooking the whole absorbing spectacle, which doubtless will be crowded with new, unpredictable exhibits.

The simple vision makes sense, and everyone who cherishes civilized life should help to make it come true.