

GYORGY KEPES

The Visual Arts and the Sciences:
A Proposal for Collaboration

THESE LINES are hesitantly written by a painter, whose tools are images, not words, who feels at home in the visible world rather than in the complexities of concepts, and whose commitment is to qualities of the seen world, not to disciplined interpretations of measured phenomena. The thoughts presented here have grown out of an internal dialogue between dreams of the full life and the recognition that our circumstances seldom permit them to come true.

I sometimes dream about being just a painter, painting and forgetting everything else—living in the richness of the moment—like the feeling I remember of swimming without any sense of time or goal, feeling the cooling touch of water, the warmth of the sun, the effortlessness of movement. But such experiences of timeless blending into the enveloping natural world are rare. A painter, too, may find a sense of abandon when the interplay between brush strokes and not-yet-visible but intensely felt hidden images develops freely into life. But such glimpses of felt unity with the “primal sanities of nature,” disregarding measured time and parceled space and finding an exalted confidence in mere being, also come only rarely and do not last. Each moment of our contemporary existence reminds us that we are growing out from yesterday and moving toward tomorrow, and that our individual survival and self-realization can be guaranteed only by the cooperative acts of other men. We live in history and we live in society. Yet even though we may recognize that our lives are secured by the combined efforts of the social body, our explosive, unresolved mid-twentieth-century life compels us, as individuals, to return again and again to the basic questions: What am I? Where have I been? Where am I going?

One of the most evident signs of the contemporary self-conscious-

ness is the obsessive questioning of what roles we are to play; and nowhere is this more true than in the urgent concern over questions of the justification, the scope, and the significance of artistic forms. In no other area of contemporary civilization are claims and counter-claims made with such vehemence, such offensive and defensive rigidity. Quacks and peddlers of fake solutions, with their artistic nostrums, are hard to distinguish from persons with honest beliefs and deep commitments. The part controls the whole. So many of our artists single out fragmentary aspects of a complete image of human experience. At one moment they are busily improvising an image of speed, casting away repose and introspection. At other times they are manufacturing new fertility symbols or paying homage to the increasing production rate of our industrial society, rejecting the broad panorama of nature. Lately, infatuated with the isolated kinesthetic act, they accept the autobiographical note of an accidental moment at the expense of the rest of life.

Some fifty years ago the Italian Futurist Filippo Marinetti orated about "the racing space, the acrobatic somersault, the slap in the face and the blow of the fist—'war,' the bloody and necessary test of the people's force." Naum Gabo and Antoine Pevsner answered him thus:

The pompous slogan of "Speed" was played from the hands of the Futurists as a great trump. But ask any Futurist how does he imagine "speed," and there will emerge a whole arsenal of frenzied automobiles, rattling railway depots, snarled wires, the clank and the noise and the clang of carouselling streets . . . does one really need to convince them that all that is not necessary for speed and for its rhythms?

Look at a ray of sun . . . the stillest of the still forces; it speeds more than 300,000 kilometres in a second . . . behold our starry firmament . . . who hears it . . . and yet what are our depots to those depots of the Universe: What are our earthly trains to those hurrying trains of the galaxies?¹

Mere revelry in the novelty of immediate visual dynamics without an understanding of their roots and of their direction of growth only prevents us from finding the way out of our blind alleys. Some attempts to come to terms with our explosive world have bogged down in just such easy-to-come-by excitement; the central interest of many artists has been riveted to the mimetic surface aspect of our surroundings.

This is not to deny that other artists have searched with admirable discipline for visual idioms capable of rendering the fundamental dynamic character of twentieth-century experience. The first, in

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significance as well as chronologically, were artists working in the early part of this century. Artists of the Cubist era realized that the visual qualities of our surroundings cannot be projected in an artistic image seen from a single fixed view. The Cubist's painted image of physical space was not the painted replica of his optical image. It was an evocation and ordering of the changing views collected by his moving, exploring eyes.

Although these painters limited themselves to a single and one-sided goal, to an exploration of the structure of images, their efforts led to the rediscovery of three fundamental aspects of artistic vision: *complementary unity*—the unity of interaction of observer and observed, of order and vitality, of constancy and change; *rhythm*—basic to all living process, and so, too, to the creation or reliving of an artistic configuration; *sequence* in the life span of created experience. Images are created and perceived as structured sequences of patterns; melodic line and contrapuntal organization are inherent not only in musical patterning but in all created forms. It is to these three conceptions that I shall relate the thoughts that follow.

Artists after the Cubists, however, went other ways. The Italian Futurists were typical. They closed their eyes to their inner world and focused on the dynamic outside environment. Living in a country that was lagging behind industrially and was dreaming of past glories—a country of museums with little relevance for twentieth-century man seeking his identity—they held that the two worlds of the old and the new could not coexist and, rejecting their heritage, they blasted away at all the inhibiting memories of the past. Thus they used techniques of recording the motion of objects that closely resembled the photographic motion studies of the great nineteenth-century physiologist E. J. Marey, and then held them to be art-saving, revolutionary innovations. They claimed complete authority for this one-sided vision and denied the existence of other forms of visual expression.

In the same way that the Futurists were blind to the past, more recent artists have been blind to the future. They have renounced the public forum and recoiled to the innermost privacy of unsharable singular moments of existence. They shrink the world to a rebellious gesture, to violent graphs of the cornered man. "The big moment came," as an articulate spokesman of this group has put it, "when it was decided to paint . . . just to paint. The gesture on the canvas was a gesture of liberation from value—political, aesthetic, moral."² But in fact, these artists recoil from the necessary vital

interaction with the outside environment and thus have broken again the essential unity of the seer and the seen.

Later, the interest of a new group of motion-addicted artists swung back again to the outside world. Instead of looking for new qualities of twentieth-century life, they produce substitute moving objects, either cerebral, impeccable, watchwork-like toy machines or self-destructive Frankenstein monsters made from corroded fragments of industrial waste. Some painters also experiment with motion, and their sophisticated knowledge of visual illusions produces amusing, well-groomed eye teasers by mobilizing every optical trick to animate surfaces into virtual motion.

A most recent group of artists has returned from abstract images to concrete objects in their environment. They have become fascinated by vulgar features of everyday life, and they have chosen them as emblems. Seductive selling devices of the competitive society—advertising pictures, containers, packages, and the mass-produced heroes of the comic strips—are their preferred images. These artists have a just resentment against the gigantic, semantic conspiracy of newspapers, billboards, and television to catch public attention through deliberate doubletalk. They recognize how language—verbal and visual—is exploited to force the responses of a passive public. But, parallel with this awareness, they have developed an attachment to objects that never left their visual field. Their unresolved mixture of private attachment and public critical social commentary takes no account of the revolutionary artistic achievements of the earlier part of the century.

Most of the mushrooming art movements seem to have forgotten the essential role of artistic creation. By and large, the art world has become the scene of a popularity contest manipulated by appraisers and impresarios who are blind to the fundamental role of the artistic image. To find our way in this bewildering scene, we must return to fundamentals and ask basic questions. We all wish that we could live without these clumsy confrontations, but we cannot evade the specific problems that we encounter in art nor the fundamental questions of our condition. The eager prophets of the *dernier cri* are blind to the basic principle that what makes today is not only today. "From the oldest comes the newest," commented Béla Bartók, an authentic spirit of our time.

Vision is a fundamental factor in human insight. It is our most important resource for shaping our physical, spatial environment and grasping the new aspect of nature revealed by modern science.

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It is at its height in the experience of artists, who elevate our perception. Artists are living seismographs, as it were, with a special sensitivity to the human condition. Their immediate and direct response to the sensuous qualities of the world helps us to establish an entente with the living present.

Yet artists today lack orientation in the contemporary world. They come together in small groups in great cities, where, in the safety of little circles that shut out the rest of the world, the initiates share one another's images. They generate illusory spontaneity, but miss the possible vital connections with contemporary intellectual and technological reality. It is unfashionable today, if not taboo, for artists to think and act on the broad terms of cultural and social ideals. No doubt moralizing in art can lead to creative suicide, just as market-policed and state-policed art can lead to the murder of artistic honesty. But the other extreme—lack of intellectual curiosity and rejection of commitment—leads to emaciation of artistic values.

It seems to me that the overwhelming task of creating modern science on its present, large scale has used up some of our most important intellectual and emotional equipment. When a vital part in a complex machine is worn out or out of adjustment, it is wiser to stop the mechanism than to grind on to destruction. Engineers, therefore, devise arrangements that ensure orderly shutdown when a part gives way. It may be that our cultural life has had such a "safety failure," as the engineers call it. Our artists may have served us by preventing a disaster.

Nevertheless, an emotional return to the archaic, ancestral cave would obviously be a failure to function in contemporary terms. Let us not mistake this temporary standstill for a genuine answer to our long-range needs. We cannot renounce the dimensions of the twentieth century—of which the new perspectives opened by scientific triumphs are a part—just because in certain respects adjustment to them is not achieved without distress; we may suffer from exposure to the new scale, but it is necessary for us to meet it. Only complete acceptance of the world that is developing can make our lives genuinely acceptable. Such acceptance involves two tasks: to advance in every field to the furthest frontiers of knowledge possible today; and to combine and communicate all such knowledge so that we gain the sense of structure, the power to see our world as an interconnected whole.

Today there is a growing general awareness of art as an important human faculty to provide this sense of structure. Museums,

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art centers, art magazines, and proliferating galleries are doing an important job in helping the artist to communicate with the public. But with all this, there are significant areas still in the shadows, areas that will remain in the shadows unless we can find means of stimulating discourse of two kinds. One is discourse between artists who work in various media and have common interest in exploring the many potentials for them that lie in technical developments. The other is the interaction between artists and the major scientific and technical contributors of our time. Particularly in the second of these areas of interaction, the need is evident enough, if one may judge by the frequent expressions of hope for some kind of fruitful plan. Fully aware of the considerable difficulties, I wish to put forward a modest proposal.

I propose the formation of a closely knit work community of eight to ten promising young artists and designers, each committed to some specific goals. The group, located in an academic institution with a strong scientific tradition,* would include painters, sculptors, film-makers, photographers, stage designers, illumination engineers, and graphic designers. They would be chosen for their demonstrated interest and alertness to certain common tasks. It is assumed that close and continuous work contact with one another and with the academic community of architects, city planners, scientists, and engineers would lead to a climate more conducive to the development of new ideas than could be achieved by individuals working alone, exposed only to random stimulations and subjected to the pressures of professional competition and the caprices of the art market.

Beyond any doubt, unique, authentic, and essential contributions come from the hidden layers of the personality. These deeper sources of creative imagination cannot be manipulated externally, nor can they be released simply by financial aid or even optimum physical working conditions. On the other hand, the past has given us ample evidence that major creative achievement comes from the confluence of many types of creative personalities.

George Gaylord Simpson, the paleontologist, has commented that as organic evolution was brought about by interbreeding, so must our further cultural evolution today come about through

* A proposal based upon these ideas has been submitted to the administration of the Massachusetts Institute of Technology.

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broad-scale "interthinking." An experimental effort to encourage such interthinking between different disciplines in the visual arts and scientific and technical fields is more than overdue. As the twentieth century has grown older, such intercommunication has become seemingly more improbable. Lacking orientation in the total contemporary world, which holds as much promise as it does menace, many artists have inevitably withdrawn into themselves. Their only honest response to this world has been the expression of complete isolation. In their frantic retreat, many of them have adopted a scorched-earth policy and have burned their most valuable cultural belongings. Cornered and confused, some of them disguise brutality as vitality and intellectual cowardice as existential self-justification.

In a less fragmented life, before the common life of society was frozen into separate compartments each with its specialized interests and jargon, priests and laymen, scholars and artisans, poets and artists could communicate to a larger degree in the same language and could pool their feelings and knowledge in a common cultural stream. A hope for such unity can hardly be entertained when we are faced with the complexity and scale of the present cultural situation. We cannot improvise a new central theme for our lives, nor can we create a unity with a well-defined scale of values for all aspects of our civilization. But we can mobilize latent aspects of our cultural life that offer a strong centripetal pull.

The proposed small work community, by recognizing common problems of adjoining or related fields, could accomplish the dovetailing of knowledge and feeling, or of knowledge and knowledge. Engineering knowledge could serve to reinforce the insights of artistic sensibilities. The approach and craftsmanship of one artist or designer could serve to complement that of another and lead into new directions.

Among the wide range of artistic goals today, there are many that could and should be of equal concern to painters, designers, film-makers, sculptors, and others. Themes that suggest themselves for the initiation of such a program include (1) the creative use of light; (2) the new aspects of environmental art—the gearing of sculptural and pictorial tasks to the dynamic scale of the urban environment and to the new wealth of technical tools and implements; and (3) the role of visual signs in artistic communication—an investigation that could branch out into a creative exploration of subjective icons as well as of the common visual symbols in the

cityscape, and a scientific exploration of communication and the use of graphic signs for didactic purposes.

Of these and many other possible themes, I have selected the first two for concrete discussion. Each of these two cases will indicate that the task defines itself differently for different groups within the work community. The supporting personnel for each can be drawn from various segments of the academic host institution, such as electrical engineering, metallurgy, psychology, communications engineering, city planning, or architecture, as the given undertaking requires. In such a cooperative effort the value will come not only from an exchange of complementary ideas, but also from the friction of the conflicts that inevitably arise when such a group of individuals, each with his own angle of approach, works toward a common goal.

Following are more explicit statements of the scope and approach of the two selected themes suggested for cooperative treatment.

1. The Creative Use of Light

Both natural and artificial light serve as essential creative tools in a variety of areas. Most of the recent representation and communication devices that speak to the eye are based on the modulation of light—for example, photography, motion pictures, television, and, to some degree, stage design. But beyond this, light has, or might have, a dominant role in contemporary architecture and the new cityscape, as I will indicate later on. Up until now, the imaginative use of light has been a neglected area in design. With other means, architects, planners, engineers, and artists have gone far in establishing a basis for a physical environment that is, at its best, authentic in its solution of twentieth-century needs and promising in its enrichment of our life. While there have been considerable technical advances in lighting, and designers with light have made some notable contributions, there are many directions that they have not begun to explore, nor even begun to dream of.

In large part both the forms of contemporary architecture and the nature of present-day urban life have been modified by technical advances in illumination. The transmission of natural and artificial light through large sheets of glass has helped create a fresh sense of space as well as an augmented demand for light within structures. All hours of the day may now be exploited, for the sharp differentiation in nature between night and day has fused in our cities into a single time scheme of day-and-night. Without artificial lighting

in our houses and streets and vehicles, the circulation of people and goods would be reduced to a trickle. When evening comes and the lights are turned on, the city is transformed, however chaotic, blighted, or ugly its daytime face. Points, lines, plane figures, and volumes of lights, whether steady or intermittent, moving or still, white or colored, whether from windows, signs, spectacles, headlights, traffic lights, or street lights—all compose a fluid, luminous wonder. It is—again at its best—one of the grand sights of our age. Although this impressive display is produced almost by accident, a byproduct of utility, its magnificence reminds us of the concentrated and ordered beauty of the great windows of thirteenth-century cathedrals. This accidental splendor contains the promise of a new art, the orchestration of light, on both limited and vast scales.

The use of light to clarify and inform architectural spaces and complex cityscapes is not yet a discipline. We do not yet command the principles, principles which must be based on a thorough understanding of the tools of lighting as well as on a full awareness of the requirements for raising the art of using light to a high level. Certain preliminary steps must be taken. We know how to make illumination both adequate and comfortable. This has been the goal of illumination engineers who have learned all that physiology and physics can teach them concerning both natural and artificial lighting. But architects and planners realize that there are immense opportunities in lighting, and they demand more than just comfort and amplitude. Stainless steel, reinforced concrete, extensive glass surfaces, and the new structural systems naturally collaborate with the tools of lighting. Together they suggest a whole new range of light qualities for architectural surfaces and spaces, analogous to the way the glass sheath of structures such as the U.N. building condense and abstract from their surroundings by reflecting the daytime sky- and cityscape. No one as yet quite realizes, however, how to take full advantage of these opportunities. Such knowledge will slowly grow. On the other hand, it is possible that a striking advance can be brought about by an effort directed at exploring light itself as a field for the creative imagination, not merely as an adjunct of architecture and planning.

By a coordinated exploration of the use of light in research areas that are at present unassociated, we shall move toward those fundamental principles that can fully mobilize both artistic sensibility and technical knowledge. We are able to perceive a higher unity

achieved in certain traditional systems of working with light, as, for example, the techniques employed in the twelfth- and thirteenth-century stained glass, at York, Chartres, Le Mans, Sens, and the Sainte Chapelle, or in the vibrating play of light in the glass mosaics of Ravenna. We can see the same thing in the sculptural modulation of simple buildings, both ancient and modern, in the Mediterranean basin, where there is an unsurpassed use of sunlight to define form and enhance surface; or in the exploitation of mist and gray skies in the looming features of Central European castles, or in the Praxitelean use of multifaceted cutting of Parian marble to make the surface of a statue "breathe." We can see it in the use of light in modern stagecraft and photography, in advertising displays, in the electronic instrumentation of light, in projected light plays and electronically controlled lighting devices.

All the forms of light have in common certain principles, and these principles must be developed and exploited for ever wider purposes. Albert Michelson, the first American to receive the Nobel prize in physics, recognized the new scientific and technical dimensions of the twentieth century as legitimate tools and goals for artistic expression. He wrote:

Indeed, so strongly do these color phenomena appeal to me that I venture to predict that in the not very distant future there may be a color art analogous to the art of sound—a *color music*, in which the performer, seated before a literally chromatic scale, can play the colors of the spectrum in any succession or combination, flashing on a screen all possible gradations of color, simultaneously or in any desired succession, producing at will the most delicate and subtle modulations of light and color, or the most gorgeous and startling contrasts and color chords! It seems to me that we have here at least as great a possibility of rendering all the fancies, moods, and emotions of the human mind as in the older art.³

Artists a generation before us also recognized the need for a new frame of reference for their creative vision. They sought new ways to project their responses to the new possibilities. Painters, photographers, and film makers struggled to find valid new idioms with which to bring space and light into a vital focus. Magnificent artistic statements were made with pigments on canvas or recorded with light on photosensitive film. These artists were, nevertheless, frustrated and tantalized because the limits of their media narrowed and condensed the explosive range of the new experiences. Needed were a new scale of tools and a new scale of setting. Only by accepting light as autonomous, as plastic luminosity to be molded, shaped, and formed with the same limitless plasticity as the sculp-

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tor's clay, could the artist hope to find a valid correspondence between his new scale of experience and his artistic expression of it. And only a spatial surrounding generous enough in scale to shelter the explosive luminous tools could provide an adequate background. The isolated, sheltered, small space of a room in the home or in a museum is suffocatingly narrow for the fluid power of light in action. The new, rich intensities of artificial light sources, if used creatively, must be woven into the bigger fabric of the night cityscape. The mirroring of the shop windows and the interpenetration of mobile vistas, with their continuous transformations of space and form, must be accepted as background to creative figures shaped by the moving contours of actual lights.

An example may be useful here. The opportunity to try out these new tools in their new setting was given to me some years ago by a commission for a mural in the offices of a leading airline in the heart of New York City. The theme was the richness of the appearance of the nocturnal city from the air. The tool chosen was light in action. The mural, over fifty feet long and eighteen feet high, is a gray aluminum screen with some sixty thousand random perforations and larger cutouts. The sources of light are a multitude of incandescent, fluorescent, and spotlight bulbs and tubes behind the mural surface, controlled by timing and switching devices that actuate the circuits. The purpose was to create, by means of these devices, a fluid, luminous pattern with random changes, alive through the continuous transformation of color intensity, direction, and pattern. To avoid the mechanical repeat inherent in a mechanized device, many thousand different color filters were placed behind the perforations in random distribution. The underlying design idea was based upon a principle used in Peruvian fabrics: maintenance of rhythmic interplay between a constant pattern and a changing pattern. On the one hand, on the permanent pattern of the perforation a shifting color scheme was superimposed, and on the other hand, on the recurring time pattern of brightness there were superimposed cutouts and perforations varying greatly in shape and linear direction. By such means, I tried to meet some of the older reservations about the justification of a mobile visual art form as expressed by Wilhelm Ostwald:

According to this reasoning the legitimacy and the explanation of discords in the art of music depend upon the temporal sequence of concords. Is there anything comparable to this in the art of color? The answer is a very decided and fundamental "No," for the art of color—at any rate in

its present-day condition—is totally destitute of the temporal element. A discord which has been introduced into a picture, woven into a carpet, or printed on a wallpaper has to remain there, forever unresolved. It is not permissible to say that we can place the resolution beside it. There is nothing to compel the eye to look at the discord first and then at the resolution, for the exact opposition is just as likely to be the case.⁴

Although the mural has a defined architectonic role in the design of the office, which is on the street level, I intended, beyond this, to make it a part of the large space of the street outside, sometimes blending and sometimes competing with the rivers of light generated by moving automobiles, giving and taking light from the surroundings, both invading the outside space and being invaded by it.

Let me cite another example to show the imaginative teamwork of a group; it included the author, who is a designer and painter, a sculptor, a structural designer, a lighting consultant, and an architect and planner. They addressed themselves to the problem of providing a major, aesthetically and functionally valid landmark for a large city on the Eastern seaboard of the United States. The description that follows renders part of the joint report that outlines their plans, as recently submitted to the city authorities.*

A central gathering place for all the activities of the downtown part of the city is a park surrounded by the city's newest and tallest buildings. Night and day the area is a thoroughfare for businessmen, shoppers, visitors, and pleasure-seekers. Because of its location at such an important point in the life of the city, it was clear that plans for this site must envisage something more than a mere expanse of paving and shrubbery. Trees, benches, and paving stones can identify an area as a park; but to serve as a true landmark, to invite to relaxation or to rouse excitement, to intensify its character as a reference point for both citizen and visitor, a park must have a dimension, a distinctive significance, which truly sets it apart as a special place.

To achieve the desired effect, the planners in this case proposed a Tower of Light, to be located at one corner of the park, outside

* "Charles Center [Baltimore] Tower of Light, Special Study," Rogers, Taliaferro, Kostritsky, Lamb, July 1964 (mimeographed). The team consisted of Gyorgy Kepes as designer and coordinator; George Kostritsky, architectural and planning coordinator; William Wainwright, structural engineer; William Lamb, illumination engineer; and Michio Ihara, sculptor.

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a paved ellipse, where it will enjoy maximum visibility and lighting effect from a nearby bridge and an elevated walkway, as well as from a large part of the central downtown area. On the Tower of Light is to be a 25-foot-wide reflective screen suspended 100 feet above the park. At night, the many facets of this screen, covered with bright, durable gold leaf, will arrest the rays of a powerful light from the pool below and reflect them back down upon the entire park area. By day, reflected sunlight from the plaza and buildings picked up by the screen will bring to life the warm surface of the man-made sun.

Set in a shallow pool of water, two 160-foot towers of steel cable spun over a slender frame support the elliptical disk. The towers are set 30 feet apart and are securely anchored to the concrete structure of the parking areas below. The deceptive slimness of the mast, spreaders, and stainless steel filaments hides a strength known to builders of sailing craft for years but never before so purely applied to an architectural problem. Pound for pound, the towers far exceed the strength of the steel frames in the tall buildings that surround the plaza.*

At night a cluster of powerful lamps, totaling 25 kilowatts, will direct a beam of light straight up into the air. The gold-leafed disk will scatter most of the reflected light back down upon the plaza, but portions of the beam will escape, creating slim shafts of light above in the night sky. The actual lighting elements will be contained in cone-shaped islets rising from the center of the pool. By day the reflective surfaces, pointing northeast away from the sun, will glow with light reflected from the windows of the surrounding office buildings. In contrast to the disk, the masts and cables will show a dark metallic luster. One will see them against the background of sky and glass as a tense, sharp network. Thus the impact

*One of the advances in metallurgy which enable the engineer to make radical refinements in the designs of yesteryear is the availability of high-strength steels. For masts and spreaders it is no longer necessary to design to working stresses of 20,000 per square inch (psi). Bethlehem Steel Company at its Sparrows Point plant now manufactures its V65 steel with a yield point of 65,000 psi and a tensile strength of some 80,000 psi. U. S. Steel's T-1, with a different set of properties, goes even beyond this. Bethlehem also manufactures locally a highly corrosion-resistant steel by the name of Mayari-R which does not require painting to retain its strength. With a choice of such finely engineered materials, the designer is in a position to do things with his structure that were unheard of only ten years ago. Similar considerations apply to the specification of powerful new low-voltage light sources.

of the Tower of Light lies not in bulk or monumentality but rather in its freshness and ingenuity, a spirited symbol of the energy of the new city.

The tower represents an opportunity to use typically twentieth-century forms and materials to produce, by imagination and technology, a solution to an urban problem. The problem of handling a small square at the nerve center of a city, set about with tall buildings, exists today on a scale more vast than ever supposed in any previous age. Of course there have been many light towers designed before, but they were mainly for a solely functional, decorative, or publicity purpose. This design is different in several essential ways.

First, it is not an entity in itself, but an integral part of an integrating factor in a city area, the plaza. Each architectural spatial form has a day and a night life, the two frequently without any consistency. During the day, the legibility of the buildings and their interspaces is based upon patterns of light and shadow formed by a single light source, the sun. At night, however, the original unity of the buildings and their spatial community is shattered by conflicting interior and street illumination. To counteract this destruction of spatial unity, the light tower was designed to be another central light source, which could restore the legibility of a single pattern of light and shadow instead of a wild jungle of intercepting shadows produced by a multitude of lamps. Indeed, the single light source could serve somewhat as a fireplace in a living room. The gold-leafed, light-reflecting screen will give a warm glow of changing patterns and thus recall the never-resting richness of the fire on the hearth, a constant central symbol in the increased scale of man-created environment.

The second consideration in designing the tower was the awareness that each historical stage has had its preferred technical tools, that the most potent artistic imaginations have always utilized the most advanced technical potentials. The stained glass of the thirteenth-century cathedrals, the Crystal Palace of the nineteenth century are cases in point. Artificial illumination and new structural principles are among the most fertile potential creative devices of this century. The tower and the reflecting screen are based upon advanced structural principles. The light sources exploit powerful illumination tools. Together they can stand as a new art form—a luminous sculpture radiating its image far beyond its actual location and function—a part of the total cityscape, a landmark.

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On a smaller scale, there are possible pictorial and sculptural uses of light, the use of luminescence, or the channeling of light along an elaborate linear path by means of bundled optical glass fibers. Photosensitive glass, color filter overlays, polarized screens, diffraction grating are still other possibilities. Projected light could be explored in terms of its kinetic-graphic potential, as used in animated films. It could also be utilized in transient murals in which opaque or transparent flat surfaces or sculptural reliefs are brought into common play.

The devices of stage designers suggest other new possibilities. Light could be articulated in its time sequence, and the combination of stroboscopic illumination with stable light sources used to produce luminous animated sculptures.

At a more technical level, optical light and color phenomena could be applied to investigate natural processes. Technical investigation of chromatography, photoelasticity, and so forth could be developed on an exploratory basis without immediate scientific goals as possible new tools for reading nature. We should remember that at one time use of oil paint or photography was just as "foreign" to, and had to be just as much "learned" by artists as are these new tools for expressing ideas visually.

2. Environmental Art and the New Technology

There are now tremendous new opportunities to reshape our spatial environment. Our technical knowledge and competence offer us many solutions for a more comfortable world; they also offer us the means of revitalizing the urban environment by means of new artistic organization and new ways of projecting, in visible symbols, the current meaning of corporate existence.

For various reasons, these new opportunities have not yet been explored. Our best artists have concentrated on personal comments, communicating their feelings and thought through the channels of galleries, museums, or private collections. Their elegiac and lyric—or acrid!—personal comments are significant, to be sure; but there is a need for a parallel visual summation in the large-scale physical environment. In the last few decades, projects on an immense scale have transformed our cities, but very few of them have had a convincing artistic focus. In fact, there is not one new environment which is comparable to the work of some of our easel painters in expressive intensity. The gap between our new opportunities

and the artists' willingness to grasp them—to say nothing of the adequacy of their knowledge for the task—is a serious one. The transference of thinking to such a broad artistic scale cannot be suddenly brought about. There are many human, aesthetic, and technical issues that the artist must understand before he can function within this new and vast scope. Some first attempts have proved abortive because the artists involved had not enlarged their vision or learned the technique of collaboration. They were untutored in those technical potentials of our industrial civilization that can offer them a new palette for their work.

There are, then, three basic conditions that must be fulfilled if our artists are to live up to the new tasks. First, they must cultivate those neglected areas of their creative imaginations which can render them responsive to the new scale. Second, they will have to learn to adjust to and communicate with architects, engineers, city planners, and many others who are working at reshaping the environment. Third, they will have to learn to explore the new technical potentials needed to implement their findings.

The visualization of new opportunities cannot be taught, but it can be stimulated. Intense work in a cooperative spirit by a group of artists invited to join in such an undertaking as has been proposed can bring about a type of imaginative thinking which the individual artist could hardly achieve alone. A prototype task would be, for example, the chromatic organization of factories and offices where all spaces, colors, textures, and light are structured in an ordered pattern with a contrapuntal sequence. This could then be worked out further at different scales, each with its own demands and opportunities. As another project, city areas and their component form elements could be evaluated in terms of their visual intensity in a sequence of experiences. The same thing could be done with large-scale sculptures and murals in such a way as to give value to their sequential meaning as well as their individual quality. Form in its broadest sense could be considered on pedestrian, vehicular, or aerial scales. Again, these rough outlines will achieve concrete direction and meaning only as they are worked out in the collaborative projects of the painters, sculptors, architects, city planners, illumination engineers, and others.

A continuous give-and-take among the group, together with help from the outside, will develop techniques of teamwork without curtailing the initial intensity of the creative ideas. Techniques of model-making, films, or slides could be used to simulate the full-

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scale reality. Furthermore, learning to use the new tools, implements, and media of industrial production will reinforce the ideas and techniques of collaboration. The sculptural possibilities of reinforced concrete, prestressed concrete forms, plastic, stainless steel, aluminum, new techniques of welding; and the potentials of prefabricated units, pictorial use of baked enamel on steel, luminescent walls, photosensitive glass, spraying techniques ranging from metal spraying to color spraying, and new adhesives are only a few suggestions of the technology waiting to be explored.

In the Middle Ages, artists in Italy or Flanders did not limit themselves to one area of specialization. They were willing and able to participate in any visual task. Designing a tournament or a ceremony was no more outside their range than painting an altarpiece or carving a cathedral molding. They sought to complement the starkness of contemporary life, with its continual perils of disease and hunger, by an intoxicating luxuriance of visual fireworks. The Middle Ages not only needed to express, but did express, communal rejoicing in feasts of colors, in pageantry, in church windows. Our fears today, our perils, are different, but our industrial civilization nevertheless is fighting for its own heraldic embellishment. The change of seasons which throughout history has enriched our lives is now for a large fraction of urban dwellers only a rare experience. If we are to turn our cities into congenial human environments, color and light, form and texture will have to be domesticated in a creative sense.

These remarks have indicated in rough outline some of the rewards possible from collaborative endeavors as the habit of continuous give-and-take matures. We need to establish new relationships in which artistic forms will be an integral part of our man-created surroundings, not mere decorative face-lifting or prestige gestures. New technical tools and materials; new approaches to teamwork among creative individuals in the arts and in the sciences with different backgrounds and training; new awareness of the interplay of visual factors in the dynamic urban scene—these are the challenges to collaborative daring.

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