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STRUCTURE AND TEXTURE

The familiar stylistic distinction between Classic and Baroque is better stated as a distinction between structure and texture. The distinction does away with dates. It applies as well to Byrd, who is a structural composer, and to Gibbons, who is a textural composer; to Schoenberg, who in spite of his predilection for retaining the structural sectioning by formally designated worked-out movements, is from the first a textural composer, while Stravinsky, who delights in all mannerisms of texture, remains throughout firmly structural.

The search for larger form during the harmonic period of European music proceeds out of three types of themes: one type which may be called textural and two which may with differentiation be called structural.

A textural theme consists of a melody, not irreversible and capable of furnishing its own accompaniment. The theme is often in two sections, the whole or either section being potentially capable of statement in reverse order, or in inversion, or of being mirrored in some instances by an equal but contrary statement. While these possibilities of the textural theme are never realized in the works of Byrd and Gibbons, they underlie all textural composition as well as all applications of textural method by structural composers, and continue as lively as ever in the works of Schoenberg and Webern. All extensions, positions, and partialities of the musical working are derived ultimately from the full melodic organization of the theme. Harmonic relationship is subordinated to the positionings of voices; its working out is conditioned by the harmonic possibilities set up by the intervallic relationships of the melodic theme, taken in melodic order. When the intervallic relationships deny any key, the resulting composition must be without key, not polytonal, as Webern and Schoenberg recognized with misgiving. The melodic themes of Bach contain more possibilities of interrelationship in varying degrees of harmony than those of any other composer. The design is unfolded rather than explored, the length being a condition of the elaboration. The marvel of Bach's workmanship is seen best where he seems to have enjoyed most displaying it for his own pleasure, in compositions for two or three voices, where the beauty is by extension rather than accumulation.

Beethoven has left one such theme, unexploited, a subject with which one might attempt another Art of Fugue, the subject of the first Bagatelle, opus 126.

The more potent of the two types of structural theme, that one which may be called the truly classical, begins most often in a tune or figurative fragment and can evolve around so little as a single interval. As the textural theme is not the original statement but its potential, so the classic theme by structure is not the tune, the fragment, or the interval, but the unit, which is exposed, analyzed and recombined, and which may often bring forth new themes—as with Ives. The logic of a structural theme is displayed against the background of its reconstruction in unfamiliar positions and in relation to the progress of the harmony. The moving voice or voices are conditioned harmonically by the successive positions of the bass, in short figures or long plateaus. The progress from one position to another by modulation, transition, or variation sets up a journey of events, dramatized by their successive relationships with one another and to the original key harmony.

With Ives, the polyphonic independence of the voices often redistributes a simple harmonic and contrapuntal relationship, so that the sense of implied bass is done away with, yet the musical result is not atonal, and any listener who expects a bass to be either evident or absent is quite lost.

Any rise or fall by a chromatic interval in the bass can severely affect the harmony. Whether such a change is to be a storm or a breath over the waters depends on the context. In textural music, by contrast, the chromatic rise or fall of the bass obscures instead of determining the context.

Any structural composer, as he enlarges the scope of his method, finds more use for texture, to expand the incidental developments of chromaticism, as counterpoint or modified fugue, the structure supplying a framework for the texture. Textural composition can continue only so long as the theme permits; the addition of themes allows added sections and in some cases a final combining of themes. Thus a fugal movement, in structural composition, is likely to contain the opposing theme group of a tight sonata movement, so that the fugal theme, however prominent, is seldom the sole determinant. The alternatives are perhaps most evident in Beethoven's last sonata, opus 111, the first movement essentially structural, the second essentially textural. Fugue, however, does enter into the first movement, and a continuous progress of modulation into the second movement. The utmost effect of structural music is brought about when the harmonic control, after having been most thoroughly threatened by an eruption of independence in the moving parts, is firmly and finally reasserted by the composer by means which make clear that, however far afield he may have wandered, he has never lost direction. This drama and reassurance, combined, explain the emotional authority of Beethoven: no matter how "tragic" the events his music figuratively suffers, he is never defeated at the end. Mahler, accepting the authority of this method, willfully allows the harmonic control or direction to fall away or slacken without emphatic reassertion, so that the denouement occurs brokenly, as "pathos." That these moral conclusions do actively express a genuine state of mind there can be little doubt, but we are unwise to judge the worth of a composer by the moral effect or appearance of his method. Mahler's Ninth Symphony affirms and reaffirms, yet the very insistence of Beethoven's Credo in the Solemn Mass raises grave doubts concerning his belief.

The second or romantic type of structural theme consists of an irreversible melody or melody and accompaniment. Such a theme cannot be manipulated texturally or with analytic economy by structural concentration, having to assert its full length in sequences of juxtaposition, no matter how inworked or overworked. (Continued on page 7)
The pages of architecture magazines are hosts to endless discussions of the roles of architects and sculptors in collaboration. Advice is solicited nearly every year in the form of symposia on the subject. And every year the sculptors tell the architects that they should be privy to the plans from the ground up, and every year the architects tell the sculptors they don't understand the architect's problems. So the argument trails on from year to year with tiresome polemics and few results.

Not one of the usual prescriptions was followed in the exceptional collaboration involving Philip Johnson, the state of Israel; and the sculptor Shamai Haber. Philip Johnson was approached by Israel's minister of defense, Shimon Peres, to design a building to house a nuclear reactor. He had never been to Israel, and even after he won the commission, he didn't go to Israel. He still hasn't been to Israel. This in itself is somewhat unusual.

Johnson was not supplied with a budget or any other strictures. The defense minister, described enthusiastically by both architect and sculptor as a remarkable man, gave him the free hand every architect dreams of. He supplied Johnson with photographs of the terrain—a powerful, bleak coastal plain of sand and scrub set on a height—and confidently awaited the results. Johnson knew only that the site was elevated and that one could see the long line of the sea in the distance.

Naturally, Johnson cannot praise his patron enough. "It could only happen in a state like Israel," he says. "Not only did they leave everything up to me, but they built it exactly as I drew it, without supervision." Even the unusual stairs he designed for the interior were executed precisely, to his astonishment.

In creating his taut, sculptured building, Johnson bore in mind that the interior would have to house a large crane turning within it. "I could have made it a bubble, a cube, or a plain parabola," he explains, "but I chose what I thought would make a better shape—hyperbolic parabolas." As it turns out, these hyperbolic parabolas with their wide curves are tremendously dynamic in the sharp sun, deflecting the light and giving an illusion of movement exactly corresponding to the function of the elaborate machine within.

With the stern terrain in mind, Johnson chose raw concrete, gray and nude (and also cheap) for his building. Its long walls, unpierced, lie

(Continued on page 6)
ARTS & ARCHITECTURE

CONTENTS FOR JULY 1962

ARCHITECTURE

Small Store Building by James G. Pulliam, architect 10

Hillside House by Raul F. Garduno 12

Community Church by Richard J. Neutra, architect 14

Steel Bridge House by Craig Ellwood 16

Office Building by Daniel L. Dworsky, architect 17

Metro Linear System—San Francisco by Reginald F. Maleolmson 20

House in Australia by Andrew Young, architect 26

ARTICLES

The Artist and the Scientist by Jules Langsner, Part I 18

SPECIAL FEATURES

Music 3

Art 4

Notes in Passing 9

A Science Film by Charles Eames 22

Design for Sport—The Museum of Modern Art 24

Currently Available Product Literature and Information 28

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along the land with the awe-inspiring presence of ancient monuments. Their powerful horizontal silhouettes remind me of a moon temple in Peru, crowning the bluffs toward the sea. The parapet, by the way, forms a lonely walk overlooking the sea. Below, an inner courtyard, colonnated and glassed, provides a more secret ambulatory.

Now we come to the second unorthodox element in the collaboration. He is Shamai Haber, an energetic sculptor, citizen of Israel and resident of Paris. He had never met Philip Johnson and indeed, had never seen the nuclear reactor building. In his Paris atelier, he had been dreaming of a monumental sculpture for Israel. Already in his mind he had formed an image of what it would be: five great monoliths on the desert plain. When first conceived, they were to have a superstructure of glass and an elaborate scheme of fountains which would trickle water over the stony flanks of the sculpture, but Haber later relinquished these complicated details.

Having heard of the remarkable Minister Peres, Haber paid him a visit and announced that he wished to make a great sculpture for Israel. The minister was pleased. Go have a look at Philip Johnson's nuclear reactor and come back, then we'll talk, he told Haber.

Haber went. Conditions couldn't have suited him better. He found Johnson's building superb, and the terrain exactly what he wanted. As a stone sculptor who has always favored rude materials and elemental designs, its dry and barren face was an inspiration. He determined to make his five monoliths there, a monument 'that would be a response to the architecture.'

Back he went to Peres telling him roughly what he had in mind. Again Peres concurred without question. Whatever Haber wished to do he could do. In addition, he could count on all the assistance he needed. This was particularly important since Haber intended to combs Israel in search of the right granite. When he found it, he quarried the pink stone with a team of workers and transported it with great difficulty to Rehovot, the site of the reactor.

Johnson recalls that he first heard of Haber when the sculptor wrote him a letter describing his enthusiasm for the building and asking permission to proceed with his sculpture. From photographs of Haber's previous work, Johnson felt Haber was his man. "It was collaboration by instinct," he says. Incidentally, the collaboration was so successful that the two are discussing future plans.

From Haber's point of view, this successful collaboration is a great augury for the future. A short, powerfully built man given to ebullient declarations, he is convinced that he will realize his grandiose schemes to enrich the "noblesse" of sculpture in our century.

"I have always worked in stone," he explains, "and it is natural for me to want to do public sculpture. When you do a sculpture on a particular site you are able to give a supplementary dimension to everything around. The distance between the buildings and the sculpture, for instance, or between the sculpture and the horizon, becomes my material. My sculpture will give meaning to everything around it." Furthermore, Haber says, a monumental sculpture like his Israeli monoliths is sociologically significant. It re-transforms the artist into a member of society, he thinks. "Society needs my sculpture as much as it needs the cinema." Noblesse, noblesse, he repeats, such as Bernini and Rodin—that is what he is after.

The story of Haber's Israeli accomplishment goes back to an exhibition two years ago at the Stedelijk Museum in Amsterdam. "I saw all those sculptures of mine done in the studio and I was very unhappy." Then he spotted a fountain outside the museum and it struck him that he would project water on glass, combine it with granite, and produce a fusion of elements—the antithesis of mechanical, man-made structures, and of the gratuitous static qualities in his own past work.

Haber clung to this dream until he had hauled the huge chunks of granite down to his Rehovot site. His vision of five monoliths, the first six meters high, the second five, and so on, was conceived in relation to the rhythms of the reactor building. In the arid plain he needed water. When he got his stones there, he saw that what he wanted was not a cascade which would blur the massive strength of his stone forms, but a rectangular lake which would serve as their base. This lake would be a response for the rectangle of Johnson's long walls. Its waters would reflect the monoliths, and the rectilinearity of its basin would provide a tension for the natural irregularity of the monoliths' summits. (Haber left them rough-cut on purpose.) The dynamic and static elements would then correspond to Johnson's design in which the severity of the walls contrasts with the curving parabolae.

What Haber finally wrested from his gigantic masses of pink granite was an ensemble of roughly hewn shapes clustered together like mysterious ruins. There surfaces are chiseled with irregular striations leading the eye upward to the deliberately chipped, asymmetrical terminals. In profile, each monolith gives the appearance of having been gnawed by the elements. Their wavering outlines are subtle allusions to the curvilinear dome of Johnson's building. The warm pink of their surface will diffuse light softly, in contrast to the sharper way the cold concrete will bounce it off.

Instinctively, Haber was able to complement Johnson's building. The moral of this story is so obvious I will not even bother to conclude with it.
by manners or methods from the other systems. Critical theorists, having in mind the economy of classical structure, find the resulting composition unwieldy, as it may be when it reaches the extremes of Bruckner. Problems of length displace the priority of modulation and transition. Schubert's lyrically inclined subjects seem to have solved the problem merely by their presentation, but the irreversibility becomes the more evident as the composition grows, though the unequalled inventiveness of Schubert in his later positions turns even this condition to psychological and emotional advantage. Berlioz, Liszt, the Chopin of the sonatas and concertos, still more their lesser contemporaries and inheritors, show the defect of the dilemma without Schubert's compensations; as their benevolence they cannot make so much virtue of the defect as Schubert does.

The temptation to apply classically structural and textural devices to irreversible themes causes the unwieldiness of contrapuntal compositions by composers who, as Liszt did, to apply to such a theme the textural transpositions of Bach; it thickens the technical rationalizations of Brahms, implying conflicts which Brahms resolved conservatively but which, carried to their conclusions, eventuate in the unresolved dissonances of the early 20th century.

The application of textural principles is the subject of nearly all Bach's exemplary music, so that ideally the student will learn how to spread out a figured bass by mastering the elaboration of thematic possibilities in independent composition. The theme of Bach's Goldberg Variations is the bass, around which, from the first presentation, melodies are woven. We have reason to believe that Bach and Handel were able to elaborate a figured bass to a degree unequalled by their contemporaries, though the influence of Italian operatic style on Handel may have caused him to prefer an accompanying figure simpler than that of Bach.

Schubert and Liszt often raised their accompaniments to greater prominence than the sustaining melody but without altering the irreversibility of the subject or the method of structure by juxtaposition. The elevation of the accompaniment plus the resulting interest in coloration eventually destroyed the governance of the bass, so that the composition wanders freely upon its harmony but not within it.

Bach uses structural devices in all extended compositions, which could not otherwise have been successfully extended: by key relationship; by plateaux of modulation, though these are exceptional; by introduction of additional themes, each extended separately, and by combining themes after such initial presentation; by contrasts of rhythm and style; and by return or ritornello of a section.

Handel mediates between textural and structural composition, the movements of his larger compositions as well as the whole body of any set of variations being organized around a single distinct idea, whereas Bach thinks almost unfailingly by the related meaningful textures of an entire work. The tendency to think by separate movements breaks up the continuity of Handel's keyboard suites, whereas the whole of any Bach suite or partita and indeed the whole of each book of keyboard music as Bach planned it flows together as a completely interconnected organization, no matter how many diverse ideas may enter into it.

The shape of a textural composition is its span, though the tendency to increased embellishment and to stretto may produce a more complex elaboration in the second half than in the first. Very large compositions tend to be organized sectionally, each part being separately worked, the accumulative elaboration being sometimes directed to the center rather than to the end: thus, therefore, and thereafter, like a play by Shakespeare. A structural composition is put together by contrast of independently organized movements, the structural development working inevitably towards climax. The shape of a large structural composition is obtained by contrast of forms, each movement being itself separately blocked out, usually in relation to the controlling harmony, on successive plateaux of recession and return in relation to the home key. A structural master expresses himself decisively by the climactic procession of events, where a lyrical composer such as Boccherini merely progresses. In Beethoven the extremes of recession between the moving voices and the bass introduce ideas and sensations of conceptual space, which the 19th century composer preferred to fill in harmonically, while the 20th century composer of anti-traditional intention separates the space from its harmonic determinant and uses it for its own sake. Silence, a rhythm, becomes a determinant, and comes in Beethoven a dramatic moment, and in more advanced 20th century composition a determining factor of the design.

Structural music, being episodic in succession, becomes phenomenal; it therefore admits overt description of events, as in battle music or nature music or tone poem or Strauss's contrapuntal bathwater going down the drain. Byrd's suite The Battle is probably the first large composition surviving in this kind—one of the best and very much worth knowing.

The notion that episodic and descriptive composition must be somehow less than abstract composition is justified only as one has a higher regard for the integrity of textural music. Beethoven's greatest works employ means at each level, as in the Dankgesang of the Quartet, opus 132, which describes an illness and the state of mind of the sick person in episodes applied to a texture of the utmost purity, Schoenberg's String Trio is a no less moving example of strongly textural composition on the same subject. Textural compositions can embody the abstractions of theological or moral argument, as Bach constantly demonstrates.

The inclination to violate this higher possibility of meaning by inserting episodes for fun or excitement goes far back in European music, becoming a nuisance when the episode detracts from the composition, not less so when the episode is abstract, and pretentious when the composer uses elaborate contrapuntal means to combine structure and texture about a trivial subject. Musical jokes are worth making, in the right place, in the notable means. Strauss's Don Quixote is full of well-made jests that improve with acquaintance. Incongruity of substance soon wears the texture thin.

The design of a classically structured movement is determined by its bass, upon which the harmonic blocks move from position to position. The texture of a structural music, however elaborately counterpointed in all parts, will require an increasing assertion of the leading voices, as these move into independence of the harmonies asserted by the bass. Structural music is therefore less stable than textural music, because the increase of harmonic independence in the voices threatens at all times to disrupt the
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harmonic control, unless this control exerts itself by imposing limits on the independence of the voices. The former is more characteristic of Beethoven, the latter of Brahms. When the harmonic control reinstated by Brahms was eventually shattered by the continuing influence of Schubert and Liszt through the two extremes of Wagner and Debussy, the harmonic governance of music was destroyed.

The keyboard art of Beethoven will be more easily enjoyed in public performance than that of Bach by so much as it deviates from a whole integrity of texture into a moment by moment immediacy of structure; and the keyboard art of Bach is more satisfying for the reader than that of Beethoven precisely because of its unceasing integrity of texture.

I have to put these thoughts in order because I have encountered recently many persons who justify a narrow adherence to one type of listening by saying that they prefer structural to textural music, meaning usually that they prefer climax to context. The excuse is invalid, since an adequate appreciation of harmonic music requires in the listener an equal ability to appreciate both textural and structural methods. For the experienced listener the close attention required for the enjoyment of all types of texture, apart from the larger evidence of structural devices, will be I believe eventually the more rewarding.

I might append here a further observation concerning Mahler. Though he found constant inspiration in the work of Bruckner and none in that of Brahms, Mahler was in fact quite independent of both. He borrowed devices, not method. Mahler's structural intentions as a symphonic composer were consciously confounded by his natural gift of melody and the skill in counterpoint he had learned by ceaseless study of Bach. He understood thoroughly and put to the textural theme in its four positions, but the lyrical gift prevented him from tightening the melody to the uses of counterpoint and the counterpoint to the full advantage of the theme. Beethoven would have been in the same pickle, if he had conceived whole melodies as naturally as Schubert. Therefore Mahler's work is often diffuse, and the diffuseness, which he must have been the first to recognize emphasized his natural discouragement and pathos. He was only 14 years older than Schoenberg, a contemporary, not a predecessor. Schoenberg, beginning with the same problem, came to his solution by way of the "tiny-work" of Brahms. That is to say, he went to the root of the trouble and learned there that the means were no longer suitable to the intention: as a post-Wagnerian composer one could write the Gurrelieder, as a Mahlerite (or more exactly a contemporary of and not a predecessor) one could write Pelleas and Melisande. To go farther one had to get rid of the objective and reexamine the means. In so doing he came down, like Webern, to the means itself as a composition and thence, beyond Webern, to a positive solution where retaining all the devices and means accumulated by Mahler, put them to use in compositions that were the natural outcome of their complex interrelationships. He thus restored an elaborate texture as his primary means of working and did not let this texture deceive him by trying to force it to do structural work it would necessarily reject and dissipate. Though his organizational forms were in several large instances derived from classic movements, for example the Third Quartet, this neo-classicism is quite audibly subordinate to the richness of texture, so that only a fairly skilful listener can detect, for instance, the trio of the scherzo of this quartet or give primary attention to the structural unfolding of the theme.

Too much has been written analytically about the externals of these matters and scarcely anything about what occurred internally during the elaborately contradictory evolution of musical concepts during the 19th century, all of these affairs being easily taken for granted by persons who have not really understood the difficulties and conflicts they create in real composing. That is why the consequences of these events as they emerge in 20th century music are not perceived as a natural evolution. That is why the great majority of composers today apply at second-hand outdated solutions that can be learned at school and never come near the greater musical interest that results from discovering real problems.

The genuine post-Schoenberg composer, if he has learned the active relationship of his work to that of Schoenberg, should be free of Mahler's troubles, though he may have other troubles of his own. The alternative solution is to put aside the 19th century entirely and begin fresh, as Harry Partch has done.
Architectural thought can be seen as a variation on an important theme in contemporary social thought. In our time functional analyses of society are common. In this view society and culture are seen as systems composed of inter-dependent sub-systems. The keynote here is the view of the whole as an integrated entity—analogous to a living body, each part being vitally related to the other parts and incapable of a separate existence.

When applied to architecture this doctrine yields the proposition that building is vitally related to the rest of the culture. Religion, the economy, and political ideals, for example, are related to and vitally affect architecture. Louis Sullivan insisted that every building expressed “the social conditions producing it,” and added that “the study of architecture becomes naturally and logically a branch of social science.”

That architecture reflects the culture and the society became axiomatic. But “social conditions” in a competitive, speculative, commercial, metropolitan society were regarded as unfavorable to the development of a great architecture which was thought to be unified and harmonious. As a matter of fact, architects extended the axiom even further: functional analysis was both descriptive and prescriptive. Not only does architecture express “social conditions,” but it ought to do so, and architects commonly judged buildings on the basis of how well this obligation was met. Not only is a culture functionally integrated, but it ought to be—and the culture of twentieth-century America comes in for a great deal of scolding because it is inadequately integrated. As a result they were in some difficulty. On the one hand, if architecture is “but the inevitable consequential product of the intellectual, social, and technical conditions of the age,” there might seem to be little reason to gripe about the nature of that architecture; it could be nothing but what it was. But complain they did; their growling about the state of their art in our time forms a large part of their writings. However, they commonly go on to complain about the culture itself, and more particularly, they deplore the fact that the culture is fragmented. The architect attempting to express his society and his times (which is both a necessity and a duty) finds only a chaos; and the result can only be a chaotic architecture. We must, therefore, solve our social problems if we are to have a great architecture. If great architecture is to flourish, then social harmony must be restored. Clearly the nature of society poses a problem. Our society, according to the indictment, is rent by conflict, schizoid, sick, and as such, further changes are required in order that healing might take place. Given the view that their society was torn by conflict, it is not surprising that the innovators should have offered a program capable of justification by an appeal to harmony and “integration.” Two variations of this appeal can be discerned: the integration of the individual and his community, and the integration of man with nature. A third alternative which overlaps each of these is an appeal to “science.”

But all this was not conceived to be merely passive; it was not merely to reflect social conditions. It must also transform them. This is possible because architecture emerges from the imagination, desires, and dreams of man as well as out of the more mundane social and economic world. The architect, then, not only receives directives from his society, he gives directives also. Thus, architecture becomes a way of shaping the future. As we have seen, that future was to be lived in a neighborly, harmonious world in which man was at one with his fellows.

—ELDON L. MODISETTE
SMALL STORE BUILDING BY JAMES G. PULLIAM, ARCHITECT

BERNARD ZIMMERMAN, M. J. MATTHEWS, ASSOCIATES

HAHN AND HOFFMAN, LANDSCAPE ARCHITECTS
The building, situated on a 55' x 190' property in the shopping district of Pasadena, California, contains three ground floor stores: an art object and gift shop, a dress shop, and a pastry shop and restaurant. A mezzanine shop, reached by an exterior staircase, is located at the east end of the building. In defiance of conventional merchandising practice the owner requested that the building be set back from the sidewalk some 30' to create a landscaped forecourt. Similarly, the east building line is set back to provide open space for a reflecting pool and landscaped area as well as enclosed service facilities.

The construction is sandblasted red brick. East and west walls are glass set in a steel frame designed to resist lateral seismic stresses. The glass walls are protected from the sun by a 6-foot overhang and bronze anodized aluminum screens. The building was designed for great flexibility of interior space. The interior wood stud and plaster walls can be easily relocated to meet changing tenant requirements. Interior and exterior stairs are steel tube stringers with steel pans, filled outside with aggregate concrete, and carpeted inside. Teakwood is used for both handrails and exterior and interior panels.
HILLSIDE HOUSE BY RAUL F. GARDUNO

EUGENE D. BIRNBAUM, STRUCTURAL ENGINEER
The rear portion of the pie-shaped site, on a steep hillside, commands a panoramic view of Los Angeles. Access is from the street below only. The house, which contains 1,300 square feet of living area supplemented by 600 square feet of usable sundecks, was designed for a bachelor whose only requirement was "a great feeling of open space." Thus, a completely open plan was developed. The living room, with an 11-foot high ceiling, the kitchen and guest bedroom are oriented to the view and prevailing breezes from the northeast.

The structure is a rigid steel frame, supported on 5 concrete piers, a concrete block shear wall and two steel columns, supporting 4 x 12 select structural wood girders at 6'4" on center. The floor is exposed 2 x 6 T and G with a 1/2" plywood diaphragm over; the ceiling is exposed 4 x 10 beams at 6'4" on center and 2 x 6 T and G at the low roof. The high roof is pre-fabricated plywood vaults with sprayed acoustic plaster. Finished walls are Texture 1-11 wood siding 1/4" drywall and 1/4" polished plate glass. All cabinets are stained birch set in a continuous aluminum frame with ceramic tile counter tops. Heating is by forced air unit; insulation is 1" rigid at roofs and rock wool at all walls.

The underside of the house, 75% of which is visible, was given a great deal of design consideration. All plumbing and ductwork was concealed behind a concrete block shear wall and the steel frame which cantilevers 15' in front and 6' at the rear was left in its vibrant orange prime coat. The wood girders were stained a contrasting burnt ochre and the exposed T and G given several protective coats of Rez. The rest of the house is left in natural earthtones except for a continuous raised wood planter, painted white, which acts as a railing.
A few years ago, the congregation of this community church in Garden Grove, California, had built a modern school and sanctuary building group around a paved and landscaped patio. The congregation increased and outgrew its church building in a year. Originally, before any building had been erected, services had been held temporarily in a drive-in theater where families with small children could sit together without disturbing other worshippers, and where disabled persons could attend services in their cars.

When the first chapel was completed, it was felt that the drive-in ministry should not yet be discontinued. A permanent solution for the future had to be found and a broad and imaginative program was conceived for an open air place of worship. Ten acres of land were purchased in a citrus grove, with a view towards the northern mountain chain. The present church replaces the old sanctuary with both a new building wide open to nature, and a vast open air assembly over undulating lawns, studded and bordered with groups of rare and flowering trees.

The problem was to make the preacher's figure and motions visible and his voice audible to every one, to the family groups in cars who tune in the services through individual listening devices and to the thousands under the projected roof of the sanctuary and in the adjacent garden space. Six hundred cars, amphitheatrically parked, are tilted to bring into view the wide platform of the choir and the figure of the preacher. His wide speaking balcony is mirrored in a reflecting pool where twelve fountains symbolize the twelve apostles. Sixteen steel bents form a "visual fugue", and the bell tower rises as a marker in the landscape. The simple, direct and slender structure, imaginatively engineered, has been awarded the 1962 Architectural Award of Excellence by the American Institute of Steel Construction.

COMMUNITY CHURCH BY RICHARD J. NEUTRA, ARCHITECT

COLLABORATORS: BENNO FISCHER
SERGE KOSCHIN
JOHN BLANTON
EUGENE BIRNBAUM, STRUCTURAL ENGINEER
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ALTAR TABLE IN FRONT OF CHOIR BALCONY.

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7. LOUNGE AND OFFICES
8. SOCIAL HALL WITH KITCHEN
9. NURSERY
10. SUNDAY SCHOOL
The site is a gentle slope, the swimming pool is placed on existing grade and the area beyond the pool is excavated for the sunken terrace and lower floor. Outside the wall the natural grade is near the top of the wall at the entry and carport and slopes downward to meet courtyard grade at the pool location.

The site is an “inside lot” except for the driveway approach it is completely surrounded by other building sites. The sunken garden therefore provides privacy in the living-recreation interior and exterior spaces.

The upper level clear-spans the lower level with two steel trusses in the outer walls. The module is 3'-3" and the wall-to-wall span is 78 feet. Each truss chord consists of a pair of 12″ channels back-to-back bent from 1/2″ plate. Web members weld between channels and are 3 1⁄2″ square tubing. Vertical web members are on 9'-0" centers and additional stiffening is provided with 10″ vertical lengths of 3 ½″ square tubing welded between channels at 3'-3" centers. Essentially the structure is a roofed bridge with top and bottom truss chords serving as finish fascias for roof and floor.

The house is for a family of five. Bedrooms and baths are on the upper level, living-dining-kitchen and study on the lower level.

STEEL BRIDGE HOUSE
BY CRAIG ELLWOOD
The building consists of seven stories of offices above three levels of underground parking. The site, in the foothills of the Santa Monica Mountains, in Los Angeles, permits direct automobile access from the street to each parking level.

The window wall is made up of precast lightweight concrete units, each one-story high and one-window wide, supported on the edges of the concrete floor slabs. Each unit will be 18" deep providing a shadowed pattern along with sun protection. The width of the vertical mullions, created by the combination of two units, offers a greater flexibility with respect to the location of interior partitions when framing into the exterior wall. Recessed within each unit will be a floor-to-ceiling gray fixed glass window with a flat dark gray porcelain enameled steel spandrel panel above. The concrete units will be a natural off-white in color with a pitted surface texture.

The structural framework will be steel at the office levels and concrete in the garages. Solid portions of the exterior walls will be brick masonry. Exterior columns, parapet covers, etc., will be covered by precast concrete units with an exposed white marble aggregate finish. Black granite, teak wood paneling, and terrazzo floors accent the main entry and lobbies. The interior partitions will be incombustible drywall; the ceilings, acoustic tile. Floors will be resilient tile and carpeting over concrete.
Within the span of a few years—since the release of nuclear energy during the second World War—the scientist, in the eyes of the multitude has changed from an oddity in a white smock puttering in an obscure laboratory to an awesome being with the combined powers of sorcerer, witch doctor and oracle, whose access to the secrets of the universe makes him capable of the destruction of life on Earth.

While the vital role of the scientist in the affairs of civilization has become increasingly apparent, even to persons who do not understand what he does, the significance of the artist’s contribution to the scheme of things in the modern world has become less evident. By and large, the multitude views the artist as a pleasant chap to have around for the diversions he provides (so long as we can afford to maintain him), but in the final analysis, largely superfluous to the most pressing concerns of our society in the second half of the twentieth century.

Ironically, the stature of the artist and the scientist in earlier civilizations was reversed. Then the artist, maker of sacred images, was indispensable to society. The pictures and sculptures he created envisaged the invisible powers that determined man’s fate. Then the forerunner of the modern scientist—in ancient Greece, Egypt, Babylon, China—might have been admired for intellectual achievement, but he was not thought to possess a consequential influence on the affairs of mankind.

The twentieth century artist, divested of the vital importance he once enjoyed, does not always look with favor on the scientist. He sees in the latter a threat to those life-enhancing experiences which are the primary concern of the painter and sculptor. No more than a moment’s reflection is needed to perceive that the artist (like everyone else) inhabits a world undergoing drastic changes as a result of the thought and activities of the scientist. The images the artist creates are being influenced in one way or another by the scientist for the simple reason that thought and experience cannot be confined to separate compartments. It is not surprising that the impact of twentieth century science on twentieth century art can be seen in such past developments as Cubism, Futurism, Surrealism, and Abstraction. The revolutionary age of science we now are entering has portentous implications for the artist. It might be worth our while to scan some of these.

At the outset, let us consider the phenomenon of change. Things are changing so fast in our time that it seldom occurs to us to assess the phenomenon of change itself. Our responses to experience, indeed our capacity to survive, depend upon the flexibility we bring to the momentous changes now upon us.

The constantly accelerating rate of change, from one year to the next, in science, technology, politics, and the arts is something new in the life of man. What has happened is that the momentum of change has been intensified to an unprecedented degree. New and unpredictable factors relentlessly intrude themselves into our existence, scarcely allowing us time to accommodate ourselves to one event before we face another, though, to be sure, certain biological and emotional drives remain the same. Nevertheless, the ways in which man creates an environment to express these drives take many forms, undergo extraordinary modifications, as we can testify having lived through the middle decades of the twentieth century.

There have been so many revolutionary concepts in science, such sweeping developments in technology that patterns of change in the modern world tend to follow an erratic course and (in many instances) could not have been predicted in advance. Until recent times, traditions persisted from generation to generation, stabilizing and regulating society. Continuity was more common than discontinuity, and provided coherence, direction, and purpose. A culture might resist a novel idea or way of doing things (and history is replete with such resistances), but there was time (until now) to accommodate the new to the old and the old to the new.

Now time is against us. The new often engulfs us faster than we can adjust. Nor is there any reason to assume this intensification and discontinuity in our affairs is going to abate. On the contrary, we must anticipate many violent disruptions and the sudden collapse of one settled arrangement after another. The time may be approaching when, instead of being supported by traditions, we will have lost touch altogether with much of the heritage we now believe essential to a satisfactory way of life.

Needless to say, neither change nor tradition is a good-in-itself.
Certainly there are many changes we could do without. The automobile, for example, is a marvelous machine for getting us from one place to another and for its influence on courtship practices. But is also has turned many of our cities into a hodge-podge of parking lots and snarled arteries of traffic and is perhaps the greatest single obstacle to intelligent planning for a rewarding urban life.

Nor does it follow that traditions must be preserved at all costs. Many serious problems facing our vast urban complexes are the result of obsolete political jurisdictions that have outlived their reason for being. The Eastern seaboard from Boston to Washington now constitutes a single urban region bedeviled by overlapping and conflicting political bodies maintained out of loyalty to obsolete traditions.

The matter of change and tradition is crucial to the visual arts. The remarkable events taking place in our world have transformed the milieu of the artist, his way of looking at the world and of reacting to experience. Even though he adapts himself as best he can to these changed circumstances, the artist tends to view his extraordinarily rich heritage as something to be conserved, whether or not he draws upon it in his own work. His efforts are additions to that heritage and do not make it any less valuable. At the same time, he is keenly aware that the legacy of art can be a monkey on his back, a burden he may have to throw off if he is to create a mode of vision appropriate to his time and place. The unrelenting sweep of the scientific revolution is thrusting him into an astonishing future that tests to limit his capacity to adapt as an artist and a human being. A brief look at some of these immense changes might be helpful at this stage of our inquiry into the situation of the artist vis-a-vis the scientist.

All of us are familiar with the earth satellites and moon probes that mark the beginning of the Space Age. These spectacular vehicles are preliminary exercises for what scientists call MIS—Man in Space. MIS means much more than the propulsion of astronauts into the cosmic void, exhilarating and provocative as such adventures undoubtedly are. As a result of our new intimacy with the Moon, the Sun, the planets, and the galaxies, we no longer regard the Earth as a secure platform covered with a canopy of stars. Now we have little difficulty thinking of our terrestrial base whirling in the vastness of space along with thousands of millions of other astral spheres.

This represents an incredible enlargement of our imaginative resources. But most of us, cocooned in habits of thought, have not yet translated the implications of a cosmos measured in millions of light years into the imaginative expression. If we turn to artists of our generation, we find that the first certain point of this vast space—universe in paintings that cross space with neither beginning nor end and without resemblance to the platform on which we move in everyday life. Thus in the works of a Jackson Pollock or a Clifford Still the viewer (for the duration of the experience) is inside a spatial field rather than looking at a projection of space from a vantage point on the outside. As viewers we have learned to respond to this kind of pictorial metaphor of a space-time domain, and, like the painters responsible for these pictures, we are often unaware of the parallels between their work and that of contemporary scientists. No matter. Art (as well as science) reflects the fundamental change in man's relation to space.

Informed speculation about conditions on other planets—temperature, pressure, radiation, distribution of the elements, and so forth—suggests the possibility of primate vegetation on Mars and almost certainly a complete absence of life in the remainder of our solar system. On the other hand, the existence of intelligent beings elsewhere in the universe no longer can be brushed aside as poetic fancy or science fiction.

According to present calculations, there is a probability factor in favor of intelligent life on other astral bodies. There is now convincing evidence that the planets were formed by the aggregation of particles once (thousands of millions of years ago) surrounding the sun in clouds of gases and cosmic dust. If this theory is correct, it follows that the formation of planets comparable to Earth is not at all a singular event. The presence of gases and cosmic dust in space surrounding stars is part of the usual life cycle of these incredibly immense thermonuclear reactors. Therefore, aggregation of material into bodies comparable to Earth must have happened many times.

Even if life did not evolve (for whatever reasons) on tens of thousands of planetary bodies, the probable duplication of favorable conditions for life are overwhelming, some estimates running as high as 100,000 instances. This probability factor must cause us to change our view of ourselves as the marvels of creation.

Most literate persons today are like their counterparts in the sixteenth century when Copernicus knocked the geocentric notion of the world into a cocked hat by demonstrating that the sun was the orbital pivot of our planetary constellation. Few persons at the time could foresee how drastically this reading of the known cosmos would change man's view of himself. The concept was too new, too contrary to the prevailing structure of thought, too shattering in its implications to grasp in its fullness.

Until a short while ago, we held to a geocentric belief in the uniqueness of our species. We enjoyed the flattering assurance of being singular creatures—the only intelligent life in the universe. This ego-enhancing belief was supported by the accepted findings of physicists and astronomers. Available data suggested that our planetary system was formed eons ago following the chance passage at close proximity of two stars, one of them our Sun. Their near collision caused huge tidal waves to eject quantities of matter from the Sun into orbit around that star. In due course, these substances coalesced into planets and moons. The concatenation of such stars is infinitesimal. Ergo: the chance of other intelligent forms of life was equally infinitesimal.

In view of the much greater age of other stars than our Sun, there is also the probability factor of civilizations on other astral bodies having endured far longer than the 7000 years since man first organized his affairs into advanced culture complexes. This being so, there is some chance that other civilizations have weathered the kind of crisis our scientific culture is facing. To survive they must have managed to circumvent the impulse to self-annihilation now threatening us. As things stand now, Earth people are in a primitive stage of development for a scientific society. It makes one's head spin to realize that serious efforts are being made by responsible scientists and governments to make radio contact with civilizations presumed to exist on astral bodies outside our own planetary system. Recent advances in the control of light waves by means of optical masers have suggested additional possibilities for interplanetary systems of communication. In my view, it matters little whether we make actual contact with such beings. What counts is the influence of the concept on our view of ourselves and our world. It was not until our own generation that the Copernican view of our planetary system was transformed from a theory into practical reality. What is more, we have developed a spaceship of the same particles as his environment, as compared with previous pictures of him as lord and master of all he beholds. As more is known of how the nucleotides in the chromosomes act as a coding system for regulating the transformation of molecular structures into living organisms, the image of man may well change in an equally significant way. For one thing, we are beginning to perceive the critical significance of information systems through that part of the phenomenal world reaching from the nucleotides in the chromosomes to the complexities of the human nervous system. What bearing will this concept of life as a kind of coded information system have on our consciousness of ourselves?

The conception of man as lineal descendant of single-celled creatures has had certain indirect influences of medical research. Human cell tissues now can be removed and kept alive artificially in a controlled environment, providing cancer research with a fertile field of inquiry in aberrant cellular behavior. Intensive work in biophysics has given new impetus to studies in the processes (Continued on page 28)
METRO-LINEAR SAN FRANCISCO

San Francisco was chosen for this project from a preliminary investigation of three urban areas in the United States. The natural features of the site of San Francisco present an interesting and unique topographical problem. In developing a plan for San Francisco based on the Metro-Linear system, the intention was to test the flexibility of the system, and its adaptability to such a hilly and mountainous terrain. The basis for the plan for San Francisco, as presented here in model and graphic form, is the development of a linear complex of commercial, administrative, light industrial (port and dock facilities for shipping), civic, cultural and recreational activities, extending along the Bay shoreline, and connected by a network of roads with residential areas throughout the peninsula.

A spinal building 14 miles long and 990 feet wide, 2 stories high, winds along the waterfront, conforming to local topography. (See Typical Section.) This building provides parking on two levels with highways for cars and trucks below, with access for trucks to the ports and docks at regular intervals. Ground level is solely for the use of pedestrians who have access to, and views of the waterfront.

The roof area of the parking structure is a continuous promenade deck, also reserved for pedestrians, and affording spectacular views of San Francisco Bay as from an ocean liner. At this level large commercial blocks containing department stores and shopping occur at half mile intervals, as well as civic and cultural buildings, museums, libraries, restaurants, etc. Designated areas on this roof deck may be used as heliports, and in the south at the San Bruno Mountain Range, the roof deck is used for sport and recreation, tennis, basketball, sun-bathing, etc.

San Francisco's predominantly residential function has been retained, and industry, other than ports and docks, has been limited to a linear extension southward along the major axis of transportation from the spinal parking structure. A loop highway system connects all the residential areas of the peninsula with the linear complex extending along the Bay. In residential areas people are within one quarter of a mile walking distance from public transportation, or they may drive to work from nearby parking structures. All residents are within a half-hour maximum driving time from their place of work. Housing has been oriented for sunlight and views of the bay, ocean or mountains. Existing parks have been incorporated into the extensive park landscape of the new city, thereby discarding the obsolete concept of the park as an isolated event in the urban scene.

This project conclusively demonstrates the flexibility of the Metro-Linear system and the general aim of the plan is to show how man's inventive and technical powers can be employed in the art and science of building cities in harmony with the grandeur of nature—ocean, sky and mountains.
VIEW OF SAN FRANCISCO BAY FROM ROOF DECK ABOVE PARKING STRUCTURE.

VIEW OF METRO-LINEAR SAN FRANCISCO WATERFRONT.

A SCIENCE FILM

The United States Science Exhibit at Seattle's Century 21 World's Fair uses the medium of film to give visitors their first taste of Science at the Fair. Designer Charles Eames has produced a film which is shown as an introduction to the U. S. Science Exhibit. The film illustrates the variety and richness of science by means of multiple images cast from seven 35-millimeter motion picture theatre projectors onto a 34-foot concave wall which encircles the viewers.

It is intended to prepare the visitors for what lies beyond in the exhibition and to give them a feeling of the extreme diversity of scientific endeavor.

The film opens with an animation sequence which treats the development of science as an architectural allegory. The natural philosophers appear first in a simple pavilion. As the scientist-philosopher becomes interested in special studies, lean-tos are added; these become rooms, then wings. New buildings take form and these grow. This four-minute sequence shows how science got the way it is and dramatically illustrates the tremendous acceleration at which science has grown in recent times.

The main body of the film runs nine minutes and is a kaleidoscopic view of the scientific landscape. Through six images at a time, we see the scientists themselves; the surroundings in which they work; their areas of inquiry; their tools; and something of the attitude which has made the scientific discipline.

Charles Eames co-produced this film with his wife Ray and Glen Fleck who executed the animation. Thomas Kuhn, science historian at the University of California, served as advisor on the film, and the original musical score was written by Elmer Bernstein.

The Century 21 film offers a wealth of information to the interested viewer, but is so conceived that even the most casual observer will become aware that there are no boundaries to science and that each scientist is motivated by a search for order in the world about him.
BY CHARLES EAMES
We think of an object as being well designed when its form bears a reasonable relation to its function; when the object does actually function well; and when its form is pleasing to look at. For most of the objects used by the general public, as distinguished from those used by skilled technicians, satisfactory performance is equated with convenience. A vacuum cleaner, for example, requires no special skill on the part of the housewife who uses it, and indeed would be considered unfunctional if it did. Even automobiles and other highly complicated mechanisms are continuously revised to make their use effortless and automatic.

There are two categories of useful objects that offer striking contrasts to this condition. Tools, whether hand operated or electrically powered, require a degree of skill and conscious effort on the part of the user. The design of such equipment is therefore evaluated by a public that takes pride in its abilities, and receives even more critical evaluation by professionals in every sport.

Sports equipment, like tools, cannot be used without effort. It demands active participation and the cultivation of skill. The design of such equipment is therefore evaluated by a public that takes pride in its abilities, and receives even more critical evaluation by professionals in every sport.

These high standards of performance serve to discipline the designer. He is largely free of those irrelevant considerations which guide the development of what are called consumer objects: artificial obsolescence and dubious innovations created for merchandising purposes. He is expected to use good and durable materials, and is able to devote his time and talents to improving his work. The designs that emerge from this continuous process are characterized by intensely developed forms which directly contribute to proper use.

The objects in this exhibition range from the crossbow, the kite and the discus, which have been developed and refined for centuries, to racing cars and hydroplanes, which are mechanized products of the mid-20th century. Most were designed by groups of technicians; a few were designed by individuals whose personal preferences constitute an identifiable style. In the hands of sensitive designers they acquire a compelling visual expressiveness, and the discipline of use is made to yield objects of extraordinary beauty.

ARTHUR DREXLER
Top row: ice hockey glove, first baseman's mitt, catcher's mitt. Lower row: ice hockey goalie stick mitt, ice hockey goalie catching mitt.

Ice-axe, designed by Fratelli Grivel, Italy.

Table tennis paddle, Italy; jai alai cesta, designed by Jose Echave, Spain.

Hunting saddle, designed by J. Stubben, Germany.

Jockey saddle.

Boat, mini sail, designed by Ian Proctor, England.

Soccer ball.
The site was originally selected for its closeness to the city of Sydney, bush setting, waterfrontage, and comparatively low cost. Its disadvantages were its width, only 35', and the southerly exposure. Tight planning and a courtyard solved the problem while the proximity of a large two-story house on the western side was used to shade the court from the afternoon sun.

The living room and the kitchen directly overlook the water and a quarry tile terrace where all the summer meals are eaten. The dining room, also used as a sun and playroom, looks onto the court which is sufficiently sheltered to allow tropical planting. The entire area is visually one volume, divided by a six-foot high, white, bagged brick wall, and full height, burnt orange curtains. The three bedrooms are divided by demountable storage space. Future expansion includes a workshop-studio, and an office.
of cellular deterioration so that the ancient dream of a Fountain of Youth has an excellent chance of turning into reality, with explorations proceeding on a number of fronts. Among the most promising of these studies are experiments in bringing dead dogs back to life by means of transfusions, forced lung expansion, and mechanical heart pumping now being conducted by the Russian surgeon, V. A. Negovsky and the staff of the Institute of Defibrillation and Resuscitation in Moscow. As a result of the many studies of cellular deterioration in recent years, Huxley's grim metamorphosis of human beings into centuries old gibbous monsters in After Many Summer Dies The Swan now would have to be revamped to show centenarians in good health living in the everyday world.

The implications of such studies are awesome. Decisions will have to be made with regard to criteria for bringing one person back to life rather than another. Who is to have authority in this life and death matter? Certainly there is no reason to assume that an enormous increase of life span is wholly on the plus side. Consider for a moment the changed proportion of the old in relation to youth and middle age. Will the vast increase of "senior" citizens—to employ the current euphemism—eventually slow creative initiative because the old tend to resist change in thought and ways of doing things. Societies dominated by their elders characteristically preserve familiar ideas and customs. Will keeping man young physically assure his mental youthfulness? What will the artist's image of man look like in a world of the aged?

Consider another aspect of the immense increase in longevity—burgeoned population with problems of birth control on the global scale. Interference with personal freedom in this most vital human concern is so threatening psychologically that our society is a long way from dealing with the many complexities of the problem, much less doing anything about it. Be that as it may, the biological sciences, on the verge of a revolutionary phase comparable to nuclear physics in the first half of the twentieth century, can be expected to change human existence profoundly. Very likely, works of art will reflect, in ways now unforeseeable, this revolution of biological thought.

Coming closer to home, none of these extraordinary developments may occur unless we intelligently manage the nuclear forces capable of wiping out our scientific culture, if not all life on Earth. Can enough people mature soon enough in their comprehension of the age of science to enable the species to enter the era of MIS and the reversal of death back to life? That, of course, is the X in the human equation at this critical juncture.

The dilemmas we face are staggering but not insurmountable. Unprecedented changes in our situation are the result of human activities and are not the work of mysterious, inaccessible, and hostile agencies. "The Lord," Einstein once remarked, "is subtle, but He isn't simply mean." New definitions of purpose are required to direct our energies into more appropriate responses to our precarious situation to a handful of professional philosophers.

Consideration of human purposes wheels us back to the arts. Not so long ago, the purposeful aspect of the arts was thought to be of minor significance by determinists for whom the psyche was essentially a mechanism. For the sociological determinist, the work of art was the inevitable consequence of certain impersonal forces—economic, religious, political, and so forth—that shaped the artist's vision. The psychological determinist viewed the work of art as the product of unconscious drives and conflicts over which the artist has little to say. Hard and fast determinism is discredited in the social and psychological sciences. Contemporary thought has re-instated purpose in the account of human experience. Thus it has been found that patients of Freudian analysts have Freudian dreams, just as patients of Jungian analysts have Jungian dreams. That is to say, the dreamer is not entirely withdrawn from the purposes he consciously brings to his analysis. Studies in the effects of narcotics disclose a range of reactions that vary with reference to the purpose for taking the drug. In other words, response to narcotics is not purely chemical and biologic, and cannot be understood completely if purpose in the mind of the user is disregarded.

The artist brings a different set of purposes to his work than does the scientist. The concepts and discoveries of the scientist transcend him as an individual person, and require crystallization in a form that can be tested independently by others. The application of scientific thought in the domain of practical affairs is viewed by the scientist as a side-benefit to the purpose of increasing the store of knowledge. The artist, on the other hand, directs his efforts to a certain life enhancement. The ways in which he crystallizes visual properties into meaningful images are separable from his personal sensibility. Some residue of himself is part and parcel of the work he creates. The artist's primary purpose is intensification of experience, not the understanding of phenomena, contrary to the claims of certain of his advocates who profess to find another (and presumably higher) order of truth in pictures and sculptures.

This is not to say that scientific inquiry may not provide rewards as an experience in its own right. Indeed, scientists often speak of the aesthetic satisfactions of their work. Nor is the art object without significance as a source of knowledge. Such interpreters as the critic, historian, psychologist, and social scientist have added to our store of knowledge as a result of studies of the arts. Nevertheless, these additions to knowledge are a side-benefit to the work's primary purpose, that of life enhancement. (First part of an article to be concluded in the August issue.)
APPLIANCES

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