PLANNING FOR THE VISUAL FORM
OF M.I.T.

by

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ABSTRACT

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Submitted to the Department of City and Regional Planning of the Massachusetts Institute of Technology on August 23, 1965 in partial fulfillment of the requirements for the degree of Master in City Planning.

This thesis stems from a concern about the perceptual form of the urban environment and attempts to make visual prescriptions part of normal planning considerations. The main objective of the thesis is to make a proposal for the M.I.T. campus which designates visual quality and characteristics in addition to categories of land use and circulation. This proposal is intended to reflect an array of basic planning objectives which include visual properties.

By a survey and analysis of the existing campus environment, a consideration of alternate growth patterns, and the effect of basic environmental objectives on the Institute, an overall physical design concept is developed. Within the general framework of this visual form proposal alternative conceptual site designs are presented for crucial parts of the main campus structure. Also supporting the design are overall visual policies which are intended to be applied to the existing campus area as well as future projects and development. Apart from making a superficial test in terms of the principal visual form objectives, a real evaluation of such a study requires the rigors of actual implementation and positive structural activity over a substantial period of time. Only in this way can a process of review and a mechanism for long term control be accurately carried out.

The study concludes that general implementation and the process for review of individual projects will be the
most critical factors in demonstrating the usefulness of this method. Although a university may seem particularly appropriate for this kind of planning treatment, as a method of environmental design the concept of the visual form proposal could easily be modified and extended to include larger segments of the urban landscape. It is possible that this method could even have positive implications at the metropolitan scale. Throughout the study emphasis on the visual quality of the M.I.T. area is stressed. Ultimately, however, the success of such a proposal will depend on how it can be merged within a comprehensive planning process.

Thesis Advisor: Kevin Lynch
Title: Professor of City Planning
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INTRODUCTION
The Intent of the Study

The main purpose of this thesis is to develop a plan for the visual form of an urban university based upon fundamental criteria which are consistent with the overall planning objectives of the institution. The results contained herein make a positive proposal for the visual characteristics of the M.I.T. campus and outline the necessary controls by area and type, which will be required to guide the growth of the perceptual form of the university over the next twenty years.

The Study Method

The procedure adopted in this study was initially to identify the principal components of visual form and to set up general criteria by which the perceptual structure of an area may be evaluated. Following this a visual survey of the M.I.T. campus was carried out and notes were made on visual character, problems and potentialities. Those areas where environmental change is planned, anticipated or is likely in the foreseeable future were also marked.

A brief discussion was then made of some basic environmental objectives and the degree to which they affect the campus area and the alternative forms of
physical development open to the Institute. From among these alternatives, and based upon present internal and external growth trends, an assumption was made about the general physical pattern of development for the next two decades. This assumed physical pattern provided the essential framework for the main visual proposal.

The proposal itself is concerned with the total perceptual form of the Institute and relates to the following broad aspects of the physical environment.

(a) Clarity of the main structure and form.

(b) Intervisibility of significant parts.

(c) Visual exposure of important functions and activities from principal pedestrian and vehicular routes.

(d) Consistent static and sequential images at micro and macro scales.

(e) Clearly defined boundaries and distinct entry points.

In addition secondary criteria are presented for testing the principal architectural and connective elements within the generalized visual framework of the campus.

The design concept for the main visual form of M.I.T. evolved from a utilization of information gathered during the survey in addition to broad assumptions about academic recreational, residential and community space and form requirements. An important objective of the final design is that several schematic, alternative site
layouts can be presented for key component parts of the total structure. This flexibility is intended to avoid precise, rigid, visual prescriptions for the campus as a whole. Except for the all-encompassing effect of the general visual policies, the main proposal is intended to be a resilient and adaptive instrument, open-ended and able to exert varying degrees of environmental control.

The nature of this final proposal is a combination of graphic material and detailed written policies. The graphics consist principally of a visual form diagram indicating such characteristics as land use by symbol, density, spatial form and sequence, major views, and at control points, building bulk, form and articulation.

In a final evaluation the usefulness of this kind of study is primarily as a planning tool. To be successful, the method must become an integrated part of a total environmental design process. The specialized bias of this type of study stems from an increasing awareness of the importance of the sensuous form of the man-made environment. Any neglect of considerations in depth concerning specific planning issues, in terms of this thesis, is due to the author's attempt to emphasize the validity of establishing visual form as part of planning and urban design practice.
THE CONTEXT OF THE STUDY
City Structure and the University

Frequently, a university campus constitutes an integral part of the physical structure of an urban area, and, in general, its internal organization resembles that of the city. It can be said that in many respects the university is a microcosm of the city. They are both dynamic and complex situations with overall goals which display strong similarities. Without elaborating upon fundamental human goals such as survival, safety, choice, participation, etc., which are implicit within the broader scale of general city objectives, formal goals such as accessibility, diversity, flexibility, congruence, legibility, comfort, economy and efficiency can be equally applied to both the city and the university.²

Although the latter has simplified socio-economic patterns when compared to the city, a strong basic resemblance still persists. Not infrequently, the university political mechanism is more effective then its counterparts

¹In the past, many a city has grown up around a university which has provided a strong social, economic, and political focus for the urban community, e.g., Oxford, Cambridge, Heidelberg, Princeton, etc.

²Lynch, Kevin, Quality in City Design, p. 61-65, Appendix B. This outlines a more detailed explanation of the formal objectives listed above.
in the urban situation. This factor is critical in the satisfactory performance of any planning function and it would seem to indicate that planning for a university community, because of its relatively simplified structure, could be carried out with a much higher degree of sophistication and effectiveness than a similar municipal operation affecting a whole town. In order to test the implementation of policies designed to achieve formal goals and objectives, then perhaps campus planning can in some ways throw light upon city planning activities in general and may even indicate those areas where planning is likely to prove most successful.

Traditionally, the visual form of universities has been in the province of the architect. Steeped in a concern for environmental aesthetics, architects have taken it upon themselves to extend the rigid professional discipline required to design and execute a single building to include larger segments of the urban landscape. Where these segments have been functionally homogeneous in terms of land use, such as a university, cultural center, or an industrial complex, architects have tended to visualize them as totalities experienced at one point in time and space. Whereas a single building or even a small group of separate structures may be conceived of as terminal projects and their environmental characteristics expressed
as such, larger sections of the cityscape generally defy rigid visual control. Furthermore, a completely ordered architectural or urban setting will inhibit new growth forms.

The urban environment may be defined from many standpoints. It can be said to be perceived as a spatial pattern of activities and structures viewed differently by the diverse societal groups that live and work within it. The fabric of the city is the embodiment of a wide array of objectives expressed to varying degrees and extended by numerous changing groups and interests over long periods of time. Consequently, its physical structure is continually being altered and changed. History bears witness to the limited effect of strict architectural impositions upon whole urban areas or even significant portions of them. At a smaller scale, the university campus is no exception, and the rapid growth of educational facilities predicted for the foreseeable future requires the same overall planning discipline which is normally associated with the larger environment of the city.

The concern for the future visual form of a university becomes an integral part of the campus planning process. Given that the principal formal goals which apply to cities can also be regarded to some extent as valid when discussing a university complex, then the
visual form primarily relates to the general objective of legibility. This is a perceptual characteristic and it relies upon other major environmental objectives to create the total visual form of a particular area. Considerations similar to those mentioned above such as accessibility, flexibility, economy, comfort, etc., and the implementational constraints that they exert will all affect the visual form to varying degrees, depending upon the specific character and nature of the environment in question.

**Visual Form**

Although one can distinguish a variety of perceptual characteristics in any physical environment, the overall visual form provides the most significant and accessible general frame of reference. This applies to the large scale situation such as a natural or civic panorama and is also relevant when looking at the most minute physical and spatial arrangements.

Visual form, whether it be of a picturesque medieval town or an example of abstract sculpture, is the salient factor in establishing an image in the mind of the observer. Depending upon the vividness of this form, its legibility and underlying structure, the observer can arrange and organize what he sees into a coherent totality, capable of being explored and remembered. Also,
the components of such spatial constructions will present varying degrees of meaning to the observer. The visual linkages between parts may reinforce their functional interaction, or the perceived object may be recognized as a symbolic abstraction. The encompassing visual form can strengthen an observer's understanding of what is being seen, or it can obscure, confuse and distort functional, symbolic and meaningful communication.

"A setting will convey either clarity or ambiguity, meaning or senselessness, stimulus or monotony, pleasure or disgust. The sensuous function is as important as the demands of circulation or use."

Both in architecture and in the larger context of the cityscape, information contained in the visual experience becomes linked with a direct physical participation in one's surroundings. Unlike viewing a painting or even a distant panorama, where spatial limits are clearly defined and the observer remains in a fixed location, being within a building or in a street, one is constantly aware of the changing visual character and sequential unfolding of the environment. The visual sense is predominant with this kind of experience, yet the form of a physical setting need not be determined by the eyes alone. Walking along a narrow cobbled street at night with the sound of one's footsteps echoing against hard wall

Lynch, Kevin, Site Planning, p. 55.
surfaces and the feel of rounded, worn stones underfoot, one has positive cues to the nature of the immediate surroundings. Similarly, retreating from the glare and heat of a summer's day into the gloom and coolness of a vast cathedral, one can, even with closed eyes, sense the soaring space above.

The visual form of an urban area may be defined as its overall physical and perceptual structure. This includes not only natural features and architectural relationships of mass and space, but also additional elements such as the quality of light, color and texture of materials, and patterns of movement and activity. All of these endow an area with special characteristics and not infrequently give it a unique environmental tone. Temporal change like that between night and day, seasonal moods, and even gradual physical modification to the main structure of an area, further contribute to the constantly evolving nature of its form and perceptual image. Some urban settings can be experienced as static silhouette forms, but their true spatial quality and character is more richly exposed from a series of changing visual sequences communicated to the observer as he moves through them.

"The basic unit of our urban vision is not the fixed spatial location but the transportation defined pattern of a sequence of vistas."4

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The perceptual information received from the main sequence network can be made to explain either by exposure or symbolism the general activities and main functional patterns of the area. Independent of scale, visual form when clearly identifiable and related to function will convey meaning.

Inasmuch as one major city objective can be separated from the others then, for the visual form of an environment to be legible, it must be composed of highly differentiated vivid parts which are able to be easily and choicefully structured, and these parts must conform to a total evolutionary physical pattern. Each important component should be articulated from its immediate surroundings and linkages to other significant elements visually emphasized. Within the overall visual form there must be a fit between the physical components and the significance of the activities they contain. The environment must evoke a strong image in the mind of the observer by being well structured, identifiable, and clearly and meaningfully expressed. The identity of the area is conveyed by clarity and power of form made memorable by the exposure of its unique character and an understanding of how the area connects to elements of a larger scale.

In order to accurately test the effectiveness
of this kind of objective, considerable basic research is needed to investigate the psychological effect of environment on people. Knowledge about how individuals use the urban environment and what specific parts have meaning for them is still extremely limited. A rich and clearly structured city, we assume, will contribute to the general mental development of an individual. It can challenge and sharpen his decision, making capabilities and improve his sensitivity to visual quality. Similarly, a university complex, as a clearly defined unit within the city, can become a meaningful orientation reference and can also, by means of its visual form, contribute to the development of the various publics with which it has contact. Legibility enables the visual experiences of individuals and user groups to form a clear mental picture of the environment in question. This image can be described as an impressionistic diagram or model sustained by memory and tainted with innumerable personal experiences and meanings. Organization and transformation of perceptual characteristics in general, and more particularly sequential visual information, enables the spatial representational model of an urban environment to become further refined. Conscious and subconscious utilization of such a model of a city or urban area will occur in countless situations. Supplementing physical configuration, the additional properties
of stimulus which are manifest in the area are the critical components in the construction of this representation. Primarily the existence of such models exemplifies man's ability to abstract from complex and intricate phenomena those significant features which reflect basic organizational and functional patterns.

Although work has been carried out on the perceptual form of the city, preliminary investigation into the psychological effect and significance of architectural and urban space is just beginning. Some findings indicate that not only do people sometimes have difficulty in expressing what they feel about the physical and spatial environment, but that much of their reaction is on an emotional rather than rational or verbal level. Currently, designers can at best only make rough assumptions about the emotional response from certain environmental configurations. Many questions are left unanswered. What kinds of spaces, textures, forms, visible activity patterns cause us to feel awed, inspired, exhilarated, depressed, protected, etc.?

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5Two recent articles in architectural magazines are indicative of an increasing awareness by that profession on the need for expert consultant knowledge on the social and psychological effects of architectural and urban design projects.


Yet the results of basic research which would generally indicate the effect and reaction of individuals and groups of people to certain man-made physical environments would be extremely useful to the urban and civic designer. An understanding of those combinations of environmental elements and composite details of the cityscape that convey meaning and that are memorable would be an invaluable aid in the process of design at all scales.

Other Determinants of Visual Form

It was mentioned earlier that certain other general objectives besides legibility affect environmental visual form. Predominant among those is accessibility. This requires that the environment should be able to offer an efficient system for movement and communication between the principal internal activity centers, and functional concentrations and also provide ease of interaction between the area as a whole and its setting within the larger environment. The overall circulation network is the means whereby the physical characteristics of this objective are realized. Although accessibility may be defined and measured in more abstract terms which have bearing on economic and social factors, physical and functional constraints have perhaps the most significant visual implications.

Another important determinant of visual form is
flexibility. Prescriptions here involve the ability of the environment to change over time, absorb new activities, and also to satisfactorily provide for extensions to existing functional patterns. The environment must be able to withstand sudden stresses. Depending upon how accurately future needs may be ascertained and the anticipated effect of their combined or sequential impact upon the area, generalized or special physical growth forms and structural arrangements may be designed.

The constraints of economy are manifest in the implementation of any urban project and can have far-reaching effects on the look of an area from its total form to the most intricate detail. Long term economic programming concerning maintenance, repair, renovation and allocation of future resources all affect visual form to some extent.

Comfort and protection are additional perceptual characteristics and may be regarded in some instances as separate determinants for environmental form. At any rate most areas are required to fulfill this basic objective to some degree. Standards affecting excessive climatic exposure, noise and various forms of pollution are important. There should be a diversity in the amount of stimulus which the environment generates with no areas of perceptual overload. More specifically this means there should be potentialities for seclusion, quiet and rest as
well as participation and interaction in stimulating activity. Functional requirements and even cultural traits will affect priority in terms of this objective.

The above mentioned general objectives are by no means a complete list. They do indicate in part, however, the array of considerations necessary for planning in connection with visual form. The concern in this study is with the rather specialized environment of the university and in that light the items annotated here have some relevance. It should be remembered that although the components of objective sets are by definition interdependent and inevitably overlap one another, the basic intent and focus of each should still be evident in a final analysis.

**General Criteria for Visual Form**

To summarize, then, the following are general criteria for evaluating visual form based on certain principal objectives pertaining to the urban environment.

1. The significant activities and main functional patterns must be clearly expressed either by visual exposure or symbolism or both.

2. The major spaces and forms should be congruent, imageable, and differentiated from one another.

3. Each important sequence should be well structured, have a distinctive visual character, and directional identity.
4. There should be no areas of perceptual overload and there should be an adequate level of comfort and protection throughout with opportunities for social participation and interaction as well as seclusion and quiet.

5. There should be ease of access to the area as a whole and also between its important component parts.

6. The overall form should be resilient to change and be able to grow and develop over time.

Dependent upon the exact functional character, location and predicted future trends of the area, such criteria will become more refined and specific. Ultimately, however, visual form is the outgrowth of a program, which is staged, susceptible to change and has flexibility. It is not part of a rigid master plan.
THE VISUAL SURVEY
The Changing Character of M.I.T.

Before discussing the visual form of M.I.T. within the context of broader planning issues or commenting on the findings of the visual survey, a brief description is necessary of the nature of the Institute and its principal objectives.

M.I.T. is a rather special kind of environment and in many ways a unique education center. It has developed on its Cambridge site since 1916 from a small local college of technology, originally strongly biased towards engineering studies, to a regional institution of higher learning, and over at least the last decade it has emerged as a prestigious center for scientific learning and research with an international reputation.

The scope of its professional and academic activities has been ever widening. The initials M.I.T. connote technological and scientific excellence, yet since before WW II the spectrum of its academic curriculum has included the social sciences and the humanities. In respect of this during recent years an active policy has been followed which has tended to strengthen M.I.T. as a university in the truest sense. Today M.I.T.'s commitments to fields of study outside of science and technology are
providing it with an entirely new dimension of scholarship. A liberal education rooted in science has become the major aim of undergraduate policy. At the graduate level the concern is with professional training in response to the needs of government and industry, and also extensive involvement with pure research activity.

Of course, like all universities, M.I.T. is growing at an incredible rate in terms of students, faculty, research specialists, resources and activities. Reflecting this the physical plant of the Institute has been dramatically transformed over the last few years. For instance considerably more than half of M.I.T.'s structures have been built since the end of WW II. As an indication of the rate of growth, from 1940 to 1956 the square foot percentage increase in structures was 63%. The area of the East Campus exhibited the most extensive density increase. (Floor Area Ratio of 0.71 in 1940 rising to 1.14 by 1956) Since this latter date and to the present time the rate and amount of development has been considerable. Current plans for development at M.I.T. call for a Floor Area Ratio of 2.0. These future building requirements include a massive increase in academic and research space, extensive residential construction and further additions to community facilities and recreation.

The changing nature of M.I.T. and its overall
growth have been consistent with the principal objectives of the institution which are as follows.\(^6\)

(a) To enhance the quality and add to the opportunities for education.

(b) To create new facilities for research, to develop special fields of critical importance and to relate research more closely to teaching.

(c) To develop further the physical environment of the campus so that it may contribute more efficiently to the life of each student.

Time and again the M.I.T. Bulletin stresses the interdisciplinary character of the Institute and the need for future development to create a united community. Perhaps this stems in part from necessary inter-relationships, such as the improved connection between teaching and research mentioned in goal (b), and partly also because hitherto the growth of the M.I.T. environment has reflected an absence of a strong community life. Financial and budgetary constraints have been responsible to some extent. In addition intense academic competition and pressure of work has tended to minimize extra-curricular interests on the part of students. The absence of a properly developed

\(^6\)Extracted from the President's Report Issue 1962.
residential system and lack of contact between faculty and students further prevented the evolution of a university spirit. Initially dormitories were provided at M.I.T. as cheap living quarters near to classrooms and laboratories, and the general location of the Institute, surrounded by industry, prevented faculty from living close to the campus.

Many of these issues, which are still very much in evidence, have direct bearing on the future image of the Institute. Any examination leading to a physical proposal for the total development of M.I.T., requires both a sensitivity to the existing character and atmosphere of the campus and its problems, as well as an awareness of the overall goals to which it aspires.

The Survey Method

The following notes which refer to the visual survey of the campus should be read in conjunction with the six basic survey drawings (Figs. 1-6) and the two diagrams (Figs. 7 and 8) indicating the problems and potentialities of the visual form of the area. This survey material stresses the overall visual structure of the campus and the principal characteristics of its urban setting. Detailed visual data outlining the main problems and confusions of the campus and its component parts are not listed on the drawings but are mentioned generally within this text.
The survey was carried out primarily on foot although initially a car was used to drive around the whole area of M.I.T. in order to sense its total structure and form, and especially how the campus related to its urban surroundings. The portion of the survey undertaken on foot started by examining the principal academic complex on the East Campus and working outwards along the main circulation system towards its periphery and then over into the West Campus area. The items recorded included the principal visual characteristics such as the mass, space and texture of buildings, the nature and quantity of visible activity, and unique or especially accentuated perceptual qualities such as the location and distribution of noise, distinctive smells, obvious micro-climate conditions, and an assessment of the opportunities for seclusion and rest within the environment.

Detailed quantitative data gathering and processing was eliminated from the survey method. For instance cordon counts along the main internal corridors designed to indicate the intensity of flow and the composition of pedestrian traffic were not undertaken due to the constraints of time. Rather the eye of the surveyor was used as a visual and perceptual computer. The characteristics noted here and marked on the drawings indicate the apparent visual intensity and distribution of various phenomena. Where available, however, precise information
such as traffic counts on the major routes adjacent to
the campus was recorded from transportation studies and
used in the survey.

Setting and Metropolitan Location

M.I.T. occupies a long narrow 120 acre site on
the north bank of the Charles River in Cambridge. The
site is over one mile in length fronting on to the River
and only several hundred feet broad. There are magnificent
views from this location of downtown Boston and the area
of the Back Bay seen across the Charles River Basin.
Similarly the whole length of the campus can be viewed from
the south side of the Basin although the terminal points
of Eastgate and Westgate are not clearly defined. The
campus is not viewed as a totality and attention is focused
on the main institutional buildings, the domes and the
recently completed twenty story EarthSciences Building.
The visual prominence of M.I.T.'s location near the core
of the Boston metropolitan area enables the Institute to
be glimpsed from many points in the city (e.g. even several
blocks in from the Boston side of the Charles River Basin,
from parts of Beacon Hill, from Mass. Avenue and streets
in the Back Bay which lie perpendicular to the River, from
Longfellow, Harvard and Boston University bridges). The
predominant visual elements of the campus at this scale
are the distinctive profile of the Central Dome, the Earth Sciences Building and the main academic complex of the original pseudo-classical Bosworth building. A second dome, similar in character and form to the main one, is located at the Mass. Avenue entrance to the Institute. This element can be seen along Mass. Avenue from beyond Central Square in Cambridge on the one side, and at least as far as Commonwealth Avenue in the Back Bay on the other. On the Cambridge side of the campus from Amherst and Vassar Streets, M.I.T. is surrounded by a combined heavy and light industrial belt beyond which is a residential zone of medium to poor quality. A railroad spur serving the industrial area partly forms the northern boundary of M.I.T. Unlike the southern boundary, the campus is not visually accessible from its Cambridge hinterland, and its extent and overall form are not sensed. However occasional distant glimpses of the Earth Sciences Building can be obtained (E.G. from the McGrath Highway and the area near Technology Square).

**Internal Structure**

The internal organization of the campus is not evident from the major path system in the immediate vicinity (i.e. Memorial Drive, Massachusetts Avenue, and Main Street). The former is an expressway thickly lined with trees and runs the entire length of the campus alongside the Charles
River. Mass. Avenue is a major metropolitan arterial route which bisects the M.I.T. area into the East and West Campuses. Main Street remains buried in the dense urban fabric of East Cambridge.

Approaching the Institute there is no strong sense of entry to the campus area or arrival at an important node within M.I.T. There is no environmental setting or guidance mechanism to indicate a change from vehicular to pedestrian movement within the campus.

The East Campus

Massachusetts Avenue functionally and visually divides M.I.T. into two main districts. The East Campus is characterized by the austere gray limestone four story structures of the original Bosworth Building, and more recent extensions to it. In 1916 Bosworth established a system of four story buildings continuously linked together at all levels and free of interior bearing walls, within which academic space could be freely assigned. It was envisaged at that time that this continuous academic structure would eventually spread to several times its initial size. Over the years this design concept has been a great asset to M.I.T. Much of the flexible academic space has been divided and redivided several times allowing whole departments to swell and shrink or refill the gaps left when an activity moved to newly constructed wings. This design concept, together with a limited amount of
available open land for building, has resulted in the East Campus becoming a dense physical arrangement, with few open spaces besides the Great Court, and having primarily an internal pedestrian circulation system. Most interstitial external space is at present given over to parking.

Although the circulation network enables movement from one department to another without returning to ground level or going outside, certain orientational confusions occur. This is mainly because many different corridors both major and minor have strong visual similarities. There is no spatial or physical hierarchy to this corridor system. The principal spinal corridor which runs parallel to the main axis of the campus and connects Buildings 3, 10, 4 and 8 is a strong organizing element but it is not clearly differentiated from its secondary feeders. All too often level changes and vertical circulation elements are hidden, confusing or lack visual connection to the outside. Movement along the internal pedestrian system, between one component part and another (defined either by building number or departmental name) is often not clearly communicated. Bye and large the experience of walking along the main corridors is dull and uninteresting and adjacent activities are obscured. The method of numbering buildings is also
confusing and relates neither to the consecutive location of building masses and units nor to the main circulation arteries.

Detailed perceptual characteristics which contribute to the internal environmental quality of M.I.T. include the sound of typewriters, the scraping of chalk on a blackboard, the hard ring of secretaries' heels on concrete corridor floors, the muffled sound of faculty and student voices behind closed doors, distinctive and often unpleasant chemical smells, visually complex scientific apparatus seen through open laboratory doors, and numerous notice boards and displays. These characteristics are often richly intermixed and not coded sufficiently well to indicate proximity to a particular function or area of special activity. Even parts of the visual structure which are perceptually vivid, such as the labyrinthine and visually chaotic Building 20, cannot be located in terms of the overall form of the campus.

Entrances and exits to buildings are often obscure and visually incongruent. For example, compare the principal entrance to the Institute from the Great Court and the one at 77 Massachusetts Avenue. In terms of traffic flow, usage and accessibility the latter is the main entry point to M.I.T. despite the visual prominence of the Great Court entrance. Another much used and visually insignificant portal fronting on Massachusetts
Avenue is the entrance to Building 1. This experiences heavy traffic especially in winter by students from the West Campus residential area. A similar dichotomy exists, but on a smaller scale, in the two entrances to the much frequented Graduate House. This incongruence between back and front entrances affects other parts of the campus including Baker and Burton Houses. At Westgate the architectural configuration suggests a spatial focus on an internal court yet this is denied by the location of the entrance to the tower block which is the most significant element of the complex.

Entry to the East Campus from Technology and Kendall Squares and also from Vassar Street on the north is confusing and even when main elements and landmarks are visible, such as the Earth Sciences Building and the Central Dome, access to them is unclear. Although the main movement system on the East Campus is internal there is a secondary external circulation network. This is not a well structured system and connection to the internal corridors is not clearly defined. In winter the outdoor spaces along this path system are cold and windswept. In summer parts of this area are unshaded and heat radiates from paved asphalt surfaces. A combination of forbidding gray limestone facades and congested temporary timber structures further contribute to the austere and unpleasant atmosphere of this part of the Institute.
The West Campus

On the West Campus there are fewer visual and perceptual criticisms perhaps because the overall form here lacks the internal organizational complexity of the dense East Campus district. The western area is spatially open and each building unit is clearly articulated. There is, however, a sense of formlessness and emptiness in the area. The northern boundary of the athletic field, all along Vassar Street, is defined by an uneven cluttered wall of warehouse buildings and tall advertisement signs. Westgate forms a terminal focus to the main open space and the undergraduate residence halls on Memorial Drive create a partial screen to the south. These latter structures cut off views to the River and downtown Boston, and where there are no intervening structures, heavy tree planting becomes a visual barrier.

In contrast to the gray limestone and newer concrete buildings of the East Campus most of those on the western area are of brick. The new Student Center and McCormick Hall are exceptions. So too is Kresge Auditorium, yet the unique form and specialized function of this building deny the necessity for textural conformity with surrounding architectural units.

The main pedestrian circulation layout on the West Campus is external. The linkage between this system
and the internal one on the East Campus is visually strong but functionally weak. Massachusetts Avenue forms a physical barrier between the two networks. Dangerous crossings here and the noise and fumes from heavy traffic create definite perceptual problems. The external pedestrian system, like its counterpart on the East Campus especially around the Earth Sciences Building, experiences severe micro-climatic conditions. This is most accentuated on the long walk to and from the Westgate complex during winter. Well structured visual sequences, however, and excellent views towards the unique silhouette of the academic district make pedestrian movement on the West Campus a clearly defined and positively oriented experience. The M.I.T. vehicular circulation layout here makes clear connections to each important building unit and to the external pedestrian system. Some visual clutter and vehicle congestion is caused, however, behind Baker and Burton Houses.

There is no visual access to the area from the north and frequent truck activity along Vassar Street emphasizes the general weakness of this boundary. On the south busy Memorial Drive makes access to the River difficult.

The whole of the northern boundary of M.I.T. is hemmed in by the noisy, cluttered and visually chaotic
environment of south and east Cambridge. This is most accentuated on the East Campus and the areas adjacent to Vassar Street, Main Street and Broadway. The future form of the campus will be much affected by its relationship to this part of Cambridge. It seems likely that the most extensive type of growth within the Institute will be the expansion of academic facilities. If this is located on the East Campus, then pressure will occur at that part of the general M.I.T. periphery where at present considerable structural and activity congestion exists.

Functional Expression

Parts of the visual structure of the total campus express the institutional nature of M.I.T. These include the Bosworth Building, the Central Dome, the Hayden Library, the Earth Sciences Building, the residential blocks on West Campus, Kresge Auditorium and the M.I.T. Chapel. Only in places, however, are these components visually expressive of their special role and function within the main campus organization. General incongruities in expression are prevalent. For example, the Central Dome is a strong visual focus and symbol for M.I.T., yet it is hidden and inaccessible from the corridor system and only contains a secondary function. The internal spatial organization of Kresge Auditorium and the Armory is not well expressed on their external forms. For an important central activity
the Hayden Library has an uninspiring form although it does visually express its function. The Earth Sciences Building contains mainly normal classrooms and laboratories yet its strong vertical shape indicates an important function in terms of the whole campus. Many temporary M.I.T. buildings north of Vassar Street contain special research functions and activity, but visually these structures are often indistinguishable from their urban surroundings.

Potentialities

Despite its detailed problems and the external pressure of a dense urban fabric along most of its northern boundary, M.I.T. has considerable visual and environmental potential. This relates both to its internal structure and its total visual setting. Predominant among the latter is the general location of the Institute on the Charles River, with magnificent views of the Back Bay and downtown Boston. M.I.T can be strengthened and further developed as a visual landmark and focus within the inner metropolitan area. The total form of the Institute as a visual and functional entity can be enhanced by improved accessibility and visual connection to the Cambridge community.

Potentialities concerned with the internal visual arrangement of the campus and its immediate environs fall into two main categories.
(a) Existing good quality fragments of the campus environment which are to be preserved and possibly improved to create well structured imageable areas. This includes the following:

1. The interconnected building layout.
2. The spatial focus and courtyard which is at present developing around the Hayden Library and the Earth Sciences Building.
3. The character of the Great Court and the Bosworth Building.
4. The emerging community precinct containing Kresge Auditorium, the M.I.T. Chapel and the new Student Center.

(b) Parts of the campus which have unrealized potential and some ways in which this can be utilized.

1. More intensive use of the area along the riverfront and the possibility of locating an M.I.T. landmark element in the water.
2. The connection of the indoor pedestrian circulation network to Kendall Square.
3. A combined visual entry to Cambridge and M.I.T. from Boston near Kendall Square. This could also form a visual terminus to the campus.
4. The development of a visual entry point to M.I.T. on Massachusetts Avenue at the junction with the railroad.
5. The linking of the Westgate complex to a general residential system.
6. Linear development along Vassar Street on the West Campus to strengthen the physical boundary of the Institute.

These are some broad general suggestions for the main visual potentialities of the campus. The design and siting of a specific project will uncover many more at a smaller scale.

The following drawings which form the main body of the survey material outline the principal visual and perceptual characteristics of the campus. They indicate general character and patterns only. In terms of this study massive physical change is anticipated for the M.I.T. area and therefore a comprehensive documentation of existing visual quality from total structure to minute detail is not necessary.
defined frontage and building
non-academic personnel
institute personnel
trees
trucks & buses
cars
wider
GENERAL CIRCULATION

Figure 3

- Varying intensities of vehicular traffic and movement.
- Varying intensities of MIT outdoor pedestrian traffic.
- Indoor MIT pedestrian movement.
- Railroad.
We StqCAte Tower. nc-luic>ir K of Chape.

VI SIBIL ITY

View over playfields to Keneye, ITCamack Hall, Baker & Burton Houses and distant view of Back Bay skyline.

dramatic view of MIT skyline including Keneye, part of the Chapel, The Hult Dingled, and the Earth Sciences Building.

Magnificent panoramic view of the Charles River Basin, Back Bay including the Presidential & John Hancock Digs, downtown Boston and Beacon Hill.

area affording dramatic view (direct or interrupted) of MIT visual landmark.

panoramic view.

direct view of landmark.

direct view interrupted by intervening elements.
NOISE AND MICRO-CLIMATE

area of summer discomfort.

area of winter discomfort.

noise, including traffic sounds.
ASSUMED MEANINGFUL AREAS

major landmark.
△ minor landmark.
□ □ □ major meaningful area.
□ □ meaningful area.
□ minor meaningful area.
VISUAL FORM PROBLEMS

figure 7

poorly defined vehicular circulation.
no sense of arrival.
poor entry to campus.
poor connections.
undefined cluttered space
isolated area.
undefined campus boundary.
perceptual overload (noise, fumes etc.)
stratched, elongated, form.
building front & back confusions.
mostly hidden waterfront.
VISUAL FORM POTENTIALITIES

Figure 8

Major visual landmark.
Minor visual landmark.
Potential visual entry point.
Existing or developing imageable district.
Potential for improved access and visual connection.
Area with great visual potential eg as an edge, major landmark, or district.
Potential view of major landmark.
THE FUTURE FORM OF M.I.T.
Basic Environmental Objectives

Although the future form of M.I.T. will follow the principal goals mentioned earlier, the physical environment of the campus must satisfy more basic environmental objectives. In the absence of a precise sequence of constructional activity or the undertaking of specific projects with detailed physical prescriptions, these basic objectives will guide the broad pattern of future development. The following environmental goals are expanded from the General Criteria for Visual Form discussed previously and stated on pages 23 and 24. These items are modified here to suit the M.I.T. area.

1. Legibility

The overall campus should be a well structured, clearly identifiable and memorable environment. More exactly the unique character of M.I.T. as a scientific university in an urban setting should be expressed. This requires that the principal activities of the Institute such as teaching, research, library, administration, student housing, recreation and community facilities should be exposed or a symbol of them made evident. The overall spatial pattern and forms should be congruent with the activities housed. Internal and external pedestrian movement systems should be clearly interconnected and have
directional identity. Visual differentiation must exist between the internal vehicular network of the campus and adjacent secondary streets in Cambridge. The general circulation system both indoor and outdoor should not have orientational confusions. Entry and arrival points to the campus, and its major components, should be visually emphasized.

2. Accessibility

The Institute as a whole should be easily accessible from the surrounding street system and urban environment of Cambridge, and there should be ease of movement for both pedestrian and vehicular traffic. The internal circulation network should provide access to important common facilities and key areas of the university. Access between departments and specialist groups with shared professional interests is crucial to M.I.T. and the physical structure of the university must provide for this kind of interaction. In addition the environment should afford a setting and opportunity for causal as well as organized social contact. Included in this must be the provision of opportunities for meeting between visitors and M.I.T. staff and personnel. Finally, there should be adequate considerations in terms of accessibility for maintenance and servicing of the campus system as a whole.
3. **Flexibility**

In common with most universities the physical structure of M.I.T. is subjected to considerable growth pressures demanding both peripheral expansion for new facilities as well as internal reshuffling and extensions to existing central functions. Rapid growth on a restricted site, established and expanding interdisciplinary influences, and the increasing need for improved physical connection and communication within the Institute are some of the principal growth problems. For many years the Bosworth Building has been an excellent example of the type of flexible and internally adaptable container which suits M.I.T.'s principal functions. The nature of future growth at the Institute seems to indicate that physical and spatial requirements for the academic and research areas may best be fulfilled by a similar form of highly interconnected structures capable of multi-directional growth. This system and the other functional districts of the campus must be able to absorb both sudden and gradual change in the nature and volume of activity.

4. **Comfort and Protection**

M.I.T. should provide a variety of perceptual stimuli within its environment, and moderate levels of comfort and protection should be achieved throughout. Adjacent to poor grade housing, unsightly industry which
causes air pollution, flanked and bisected by noisy traffic on arterial streets and tightly packed on a cramped site, M.I.T. has pronounced environmental problems. The Great Court, the area near Kresge Auditorium, the proximity of the Charles River front with excellent views of downtown Boston are the only parts of the Institute which could be considered as pleasant environment. At the moment there are insufficient opportunities for an individual to find quiet and restful places on campus. The building density and intense concentration of activities, particularly on the East Campus, should be relieved with areas of seclusion and withdrawal where casual social interaction or solitude could be achieved. Protection is needed not only from traffic noise and fumes but from extreme climatic exposure both in summer and winter.

5. Economy

The economic structure of M.I.T. must be geared to provide for the continued expansion of new academic, research, student residential and recreational needs, and for the adequate maintenance of the existing plant. Considerable research has been carried out on university facilities with respect to the combined economic and functional desirability of particular forms of three dimensional planning. The unique character and locational considerations peculiar to M.I.T., however, must be taken

into account in the economic aspects of physical design. These include the constraints of a limited amount of building land and the expense of acquiring and clearing areas for new construction, the desirability and necessity even, of a dense building system, and the housing of research apparatus and plant demanding special environmental treatment.

Form Alternatives

Although broad choices concerning alternative physical forms and their supportive policies have bearing on the evolving visual structure of M.I.T., they are too general in nature to indicate perceptual characteristics or special design features. Since the intention of this study is to endeavor to make a definite proposal for the visual form of the campus, it is also important to illustrate the context of such a proposal against a background of a few generalized physical planning concepts.

Yet before any overall environmental issues can be outlined certain assumptions must be made about the Institute and its theoretical orientation towards scientific education and research. In the first instance we can assume that M.I.T. will continue to develop on its present site and fulfill the role of providing a high quality liberal education with a strong scientific emphasis. It may be further assumed that the present attitude towards
future enrollment for undergraduate, graduate, post
doctoral and special research students will be maintained.
M.I.T. is firm in its desire to curtail growth of the
undergraduate school and to allow faculty and graduate
school numbers to expand gradually and selectively.
Estimates for the more modest requirements of administra-
tive staff and office needs will easily be fulfilled. The
fast developing range of interdisciplinary activities
both at teaching and research levels is almost certain to
continue to expand; so too is non-academic pure research
sponsored by industry and the federal government. There
has been for some time an official concern about the
physical environment of M.I.T. The planned setting up of
a residential college system for undergraduates will
certainly be utilized as a means of improving the attrac-
tiveness of the campus. The latter item is also intended
to witness the increasing involvement and participation
in university life on the part of faculty. Without
detracting from the present high standards of academic
expectation and achievement, it can be assumed that the
experience of future students at M.I.T. will include
better opportunities for social, recreational and athletic
activity than exist at present. All of this is geared in
an effort to create a comprehensive educational environ-
In physical terms, such assumptions can be translated into the following broad requirements. M.I.T. must provide a tremendous increase in teaching and research accommodation over the next twenty years. An extensive undergraduate residential system is to be developed, as is the provision of a graduate center to act as a much needed community focus for the swelling numbers in the M.I.T. Graduate School. Faculty housing will be provided and possibly integrated in part with the student residence halls. Further recreational facilities will be constructed and the Institute will follow its present policy on parking.

By the utilization of these general requirements plus a knowledge of socio-economic, political and environmental conditions in the areas bordering the Institute, a series of alternative patterns for the physical growth of the campus may be sketched out. Each alternative must fulfill the general goals of M.I.T. and also the basic environmental objectives stated earlier. The selection and review of one alternative and its refinement in terms of program, technical and functional organization would create a critical basis from which the visual form and

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8 The President's Report Issue 1963 elaborates on the general character of future policies for M.I.T. The broad assumptions mentioned above are derived from that document and also the Report of the President 1964.
The potentialities for future growth on the campus are determined by existing external locational constraints as well as internal areas which can accommodate growth or whose present functions can readily be adapted or changed.

The campus could extend across Memorial Drive and out into the Charles River Basin. Although technically possible, a proposal of this nature is economically and from the standpoint of metropolitan amenity, undesirable. Furthermore external growth in most other directions is more probable.

A policy could be adopted to develop M.I.T. as a distinctly linear element by extending growth beyond Westgate on the one side and Eastgate on the other. Eventually such a policy might result in M.I.T. physically linking with Harvard and the whole forming an academic facade all along the Charles River from near Harvard Square.
to opposite Beacon Hill and downtown Boston.

Alternatively M.I.T. could choose to contain all future growth within its present boundaries by constantly increasing densities and filling in with structures all significant open space.

Another general choice would be to let the campus expand northwards only along Massachusetts Avenue (this is happening to some extent), and so counteracting linear growth along the Charles waterfront. Fusing eventually with Central Square in Cambridge the Institute would flank Massachusetts Avenue and integrate its activities and traffic with that of the city.
MAJOR FORM ALTERNATIVES

figure 9
In order to make a choice among these alternatives, or a compromise growth pattern, each must be developed in some detail and tested against basic environmental objectives and the main goals of the Institute. In this process severe constraints upon directional growth peculiar to the location of M.I.T. within the municipality of Cambridge will become both obvious and critical. Predominant among these is the ubiquitous question of tax. As things stand at the moment, M.I.T. as an institution, is tax exempt and by physical extension it would deprive the City of Cambridge of even more land which could otherwise be allocated to lucrative tax-producing uses. Encroachment by the Institute on to existing commercial and industrial areas, which presently girdle the bulging East Campus would further reduce the City's economic potential and may even cause positive hardship in terms of resultant unemployment and relocation entanglements.

Other crucial issues relevant to this study and arising from the external expansion of M.I.T. are primarily questions of physical relationship with the following areas.

1. The proposed massive NASA project to be located adjacent to Kendall Square. Undoubtedly access to and functional ties with M.I.T. will be of paramount importance. However, this project will block future Institute growth to the East.
DISCLAIMER

MISSING PAGE(S)

Page 63 omitted due to a pagination error.
2. The Kendall Square area itself, and whether or not it will be subjected to urban renewal? Already on the periphery of M.I.T. this area has tremendous potential as a commercial, service, and possibly even a cultural center adjacent to the campus community. A focal point of this nature is at present sadly lacking in the vicinity of the Institute.

3. The Technology Square area to the north of the East Campus is physically isolated and general access to it should be improved.

4. A more long term concern, but nevertheless an extremely important one, is the location of the controversial Inner Belt expressway. From the standpoint of M.I.T. the further this highway is located to the north of the campus the better. Any route selected close to Albany Street or the railroad spur adjacent to the northern boundary of the Institute would decisively seal off M.I.T. from the Cambridge community, and limit the choice of future growth directions. This would be unfortunate especially now when M.I.T. is becoming very conscious of its isolation and poor connection to Cambridge. A below grade design for the Inner Belt, however, may provide a compromise solution to this problem.
5. Finally and following up the previous point, M.I.T. requires an improved sense of connection and interaction with Cambridge, and in particular the area of the city close to the Institute boundary. Admittedly difficult to implement, but one way of integrating with Cambridge beyond just improving the physical connection, would be to encourage faculty and other M.I.T. personnel to stay close-in near the campus. Assuming a satisfactory relocation arrangement, much of the present housing particularly to the north of the West Campus could be converted and renovated for faculty. Proximity to the Institute and participation in local affairs would enable faculty and other personnel to improve the level of contact between the university and Cambridge communities.

(B) Internal Growth Trends

Certain aspects of the internal physical pattern of activities at M.I.T. seem most unlikely to change in the foreseeable future. For instance, as long as the Institute remains on its present site, the center of academic activity will almost certainly remain on the East Campus. Existing investment in plant and assured future projects reinforce this area as the academic core
of the university. Other areas are more susceptible to radical physical change. Obvious examples are the principal open space districts such as the recreational area on the West Campus, and also those parts of the Institute at present occupied by temporary structures like much of the northern sector of East Campus.

In terms of future physical planning, perhaps the West Campus open space looms as the most conspicuous question mark. Alternative Institute policies here could be either to retain its athletic use or build over it by extending academic, teaching and research facilities across Massachusetts Avenue from the East Campus.

Another choice could be to locate student housing here, so strengthening the present residential character of this western part of the Institute.

A compromise policy would be to allow teaching, research and residential facilities to develop on the area with interstices of open space for certain specialized recreational activity. Any choice which restricted the present role and scope of Institute athletics would have to be weighed against other policies which stress the importance of recreational components within a total academic experience.

The area of temporary structures on the East Campus has little choice in its type of future growth.
This part of the Institute is so committed to academic activity that temporary facilities on this site will certainly be replaced by new teaching and research plant.

What are the existing or evolving components of the Institute, in addition to the academic area, which could be exposed to alternative developmental programs? The housing precincts affecting undergraduate, graduate, married and faculty personnel are among the most important items. The West Campus, fronting on the Charles River and Memorial Drive, has been designated as the area where an extensive linear residential system is to be constructed. Yet it is possible that this could be built along Vassar Street so as to clearly define the northern boundary of the campus, and also create a more positive visual connection to Cambridge. Alternatively, instead of emphasizing the West Campus as a residential district, future housing could be dispersed evenly throughout the whole campus and provide a rich visual grain by mixing in with other functions. Conversely, Institute residential development could be clustered in several distinct foci. Based on current trends such precincts could be located at Westgate, Eastgate, the area around the Parallels and Senior House, and further development near Kresge Auditorium and the new Student Center. The physical form of housing projects could be
high towers or slabs, low connecting blocks, or a combination of both creating either a complete interconnected system or separate visual entities. Adjacent open space or courtyards for outdoor activity and social interaction would be highly desirable to strengthen the sense of community.

The same general kind of choices can be posed concerning the future of community facilities at M.I.T. Although the area around Kresge Auditorium is fast developing as the central community focus for the Institute, it need not be regarded as the only one. A series of satellite facilities could be sprinkled throughout M.I.T. or a second major center could be developed near the Kendall Square portal to the campus.

The predicted increase in pure research activity, and the separation or integration of specialized laboratories within the general framework of the academic structure, is another critical question. The form and location of such research facilities is difficult to determine. So often research plant is of both a highly specialized and relatively temporary nature. Some research elements, however, have a longer life expectancy (e.g. the Reactor and the Cyclotron). Space and structural requirements vary considerably. All of this would seem to indicate that such projects should be located on the periphery of the more permanent physical
fabric of the Institute. Moreover, they should be situated away from the anticipated direct path of physical growth.

The same kind of locational flexibility must apply to parking areas. Because of the necessary density of buildings at M.I.T., particularly on the East Campus, parking must become a peripheral item. The present policy of the Institute is to remove all interior lots and return such space to building and landscaped courts. New parking facilities could take the form of either open lots or multi-level structures.

M.I.T.'s growth affects other urban interests, within Cambridge and the metropolitan area, and in turn various policies and external goals affect the Institute. Contained on a tight urban site, any extensive physical proposal for the campus will have influence on one or more of the following local agencies: the City of Cambridge, the M.D.C., the M.B.T.A., the Department of Public Works, and the principal utility companies.
Assumptions

The following general assumptions about physical requirements and location of future development at M.I.T. will form the basis for the main visual form proposal 1985 presented in the next section of this study. Fig. 10 indicates those parts of the existing structure of the Institute which will remain or be removed during the period for which the proposal is effective. It should be noted that many of the buildings north of the railroad and Albany Street presently occupied by M.I.T. are only leased and are not Institute property.

Overall Form

The future form of M.I.T. as envisaged for the next 20 years will be a highly centralized system with maximum densities on the academic East Campus. Residential, recreation and community facilities will be situated on the periphery of this activity hub, and on the outer edges of the Institute, parking, temporary and special research projects will be located. The total form of the campus will tend to become a complete visual entity presenting a distinct boundary to Cambridge.

Academic

The academic area is to extend northwards to Main Street and eastwards to Kendall Square. One million
square feet of space has been designated for the area between Ames Street and Wadsworth Street. The present policy of a F.A.R. of 2.0 will be maintained, and this translated into physical terms can be provided by a general building height limit of five or six stories. Within the present East Campus precinct necessary extensions to administration and central library functions will be developed. The main academic envelope, housing teaching and affiliated research, will be a continuation of the existing building arrangement of a predominantly interconnected system of structures with a few isolated landmark buildings.

Housing
The West Campus will become the site of an extensive residential college incorporating the existing residence halls as well as new proposals. Most undergraduate housing needs up until 1985 can be fulfilled by a six-story linear development fronting on Memorial Drive and connecting Burton House with Westgate. Some faculty housing will be integrated within this project. New married student housing will be built at Eastgate and the present Westgate complex will be considerably expanded. The Parallels will be removed and Senior House will
remain as the only East Campus housing unit. Bexley Hall will be removed and the present Graduate House renovated. The proposed Graduate Center will be located west of Kresge Auditorium and will form an integral part of the total residential system. Where possible faculty housing will be located in Cambridge immediately to the north of the campus and also in places along the Memorial Drive facade.

Recreation
Adjacent to the expanded residential area, the principal recreational focus will remain on the West Campus. The area will be further enhanced by a proposed indoor skating rink to be located near the site of the present outdoor facility. The nature of athletic activities on the West Campus is not expected to change radically or be curtailed by the increase of residential development in that area. Proximity to additional undergraduate housing and the new Graduate Center is expected to result in more intensive usage of this recreational district. Improved accessibility to the waterfront, and the proposed boathouse there, will help create a further strip of recreational space along the southern boundary of the campus.
Community Facilities

The area around Kresge Auditorium will be further developed as the principal community center serving the Institute. Additional specialized commercial use near Massachusetts Avenue, replacing the Coop, the new Student Center and Graduate Center, together with the existing elements will all contribute to the total quality and character of this area. It is also expected that other community facilities will be created around the new Kendall Square entrance to the campus in view of the assumed urban renewal to take place in that part of East Cambridge.

Parking

As indicated earlier, parking will be located on the outer edge of the campus. A few parking structures will be constructed on Vassar Street but in general it is assumed that open lots will be developed. Improved public transportation to the Institute serving both the Massachusetts Avenue and Kendall Square portals, and the assumed increasing percentage of students and faculty resident on or near the campus, will limit to some extent the ever-increasing demand for parking space. Internal courts and other parking areas presently enmeshed
within the main structure of the Institute will gradually be eliminated and such space will be utilized for outdoor social interaction.

These are all general assumptions about the main functional components of the campus and they give little indication of building quantity or precise locational constraints affecting future development. A statement of building requirements, for instance, based on various departmental needs would be too detailed to incorporate in a general visual proposal, and would in any case be so susceptible to change that much of its apparent specificity would be misleading. General prescriptions, however, such as those outlined above, when combined with the characteristics of the principal visual form proposal, create a basis for general review and testing of actual physical projects or detailed environmental concepts as they evolve.
structures to remain by 1985.

structures to be removed by 1985.
THE VISUAL FORM PROPOSAL
While a planning proposal which indicates general land use, density and circulation will to a great extent insure the orderly functional organization and development of an area, the quality of its visual form cannot be predicted by these factors alone. Such visual characteristics should not be regarded as supplementary to basic planning issues but as integral to the planning process.

The main proposal embodied here for the M.I.T. campus incorporates prescriptions as to visual structure in addition to generalized assumptions on the growth pattern, location of specific functional areas, and overall densities for the Institute.

The visual form proposal consists of the following items.

1. Visual Form Diagram 1985
   Fig. 11
2. General Spatial Texture
   Fig. 12
3. Components of the Total Visual Structure
   Fig. 13
4. Alternative Site Concepts for Key Areas
5. General Visual Policies and Architectural Criteria

1. The Visual Form Diagram

This is the most significant component of the proposal and illustrates the location and density of the
principal functional elements of M.I.T. such as academic, residential, recreation and community facilities as well as area allocations for parking.

The total circulation network and how it relates in terms of access to the above activities is also outlined on the diagram. Included within the category of circulation are local and arterial streets, in Cambridge, which either border on the Institute or intersect with it, the internal M.I.T. service routes, and perhaps most important of all, the proposed pedestrian circulation system for the campus. This diagram also indicates the location and distribution of prominent visual landmarks, both existing and proposed, spatial foci within or adjacent to the M.I.T. area, and also some sense of the character of the main pedestrian network such as where it is internal or external, covered with an arcade or open to the sky. Future growth directions, referring to beyond the period for which the proposal is operational, are also marked on the diagram.

Based on the previous assumptions this diagram conveys the main design concept. The academic focus of the Institute remains on the East Campus and is composed of an interconnected system of structures internally flexible and of approximate uniform massing and density. This intricate physical arrangement is designed to extend all the way to a redeveloped Kendall
Square, and is bounded by Vassar Street, Amherst Street, and the Charles River Basin. Blocked by NASA, the Institute cannot extend across Main Street and so Eastgate will become a prominent terminal element taking full advantage of a unique location adjacent to the Charles River and at an important connection point between Cambridge and downtown Boston. Both on the periphery and within the tightly knit fabric of the East Campus spatial foci occur served by important circulation arteries. Predominant among these are proposed visual entry points to the campus from Kendall Square and also on Massachusetts Avenue where it intersects with Vassar Street. Both of these will emphasize the sense of visual connection between M.I.T. and Cambridge. Within the East Campus proper, and in addition to the Great Court, focal points are developed around the Earth Sciences Building and also at the proposed confluence of an extended pedestrian circulation layout at the present junction of Buildings 8, 6, and 16. The design intention here is to create a visually dramatic node at what will be the central core of the academic area.

West Campus as the major residential district becomes more defined by the westward extension of the linear building mass fronting on Memorial Drive. Thus Burton House and Westgate are connected and this will
strengthen the spatial quality of the whole West Campus. Tree planting and parking structures adjacent to Vassar Street further define the area and the visual boundary of the Institute with Cambridge. An enlarged Westgate complex, which includes a new vertical landmark, provides a terminal for the West Campus. If, however, long range development westwards takes place beyond this point, then the physical results stated here for the Westgate area will constitute an intermediate visual focus within the total linear form of the campus. For the moment, however, Eastgate and Westgate delineate the extent of the Institute, and together with other proposed vertical elements, give the whole campus a distinctive and well structured silhouette.

The existing Kresge Auditorium and M.I.T. Chapel will provide the nucleus for the proposed community center of the Institute. The architectural character and spatial form of this district will contrast with the dense rigidity of the academic district and the more open quality of the West Campus. The visually differentiated forms of the Chapel, Kresge Auditorium, the new Student Center, the proposed Graduate Center and nearby indoor skating rink, will all contribute to the special identity of this area.

Among the more radical prescriptions for the future physical environment of M.I.T. which the proposal
advocates, are those that affect the design and layout of the pedestrian circulation network. One of M.I.T.'s most obvious functional attributes is its indoor corridor system which permits east of movement and communication between units irrespective of climatic conditions. The proposal indicates extensions of this existing system as well as alterations to it. On the basis of the visual survey, the pedestrian movement network and the adjacent activity which it both supports and fosters appears to be the most conspicuous structuring element of the campus. The visual form proposal attempts to use the pedestrian system to unite the principal visual components mentioned above into a functional and perceptual totality, and at the same time improve access to latent environmental resources of the M.I.T. area (e.g. the waterfront, connection to Cambridge and Kendall Square). The most significant features of this new movement pattern are the internal connections eastwards through to Kendall Square, bridge connections across Massachusetts Avenue and linkage to the Charles River waterfront. Kendall Square will have a redesigned subway entrance and improved adjacent commercial activity. Bridge structures across Massachusetts Avenue will provide a much needed controlled transition between outdoor and indoor movement. Still important, but secondary to the main design concept, are
the proposed direct pedestrian connections to Technology Square and northwards to Central Square in Cambridge.

By creating a new pedestrian entrance to M.I.T. at Kendall Square, and providing indoor movement along a clearly defined corridor system to the present portal at 77 Massachusetts Avenue, the existing strong spinal character and activity pattern of this, the most important part of the M.I.T. campus, will become strengthened. The proposal also outlines a combined internal, open and arcaded pedestrian way from Eastgate along Amherst Street, passing the Library, across the Great Court and Massachusetts Avenue, and finally fusing with the existing circulation route which leads to Westgate. In addition the diagram indicates the pattern of secondary pedestrian ways and where they connect with the major system.

The grouping of principal landmarks plays an important part in conveying the visual image and form of a particular environment. Proposed M.I.T. landmarks are primarily located in relation to a spatial focus or at important change or intersection points on the main pedestrian routes. The intention here is to further emphasize the total extent of the campus, and also to reflect the form of major activity and circulation axes. In an environment which is so dense and intricate as the M.I.T. East Campus, visual differentiation of these new
major landmarks will improve the sense of orientation within the area, and will also enable micro districts and elements to be remembered in a more accurate relationship to the whole physical schema of the Institute.

With the general visual prescriptions of this design concept the overall form of M.I.T. becomes composed of three main districts, the East Campus, the community center and the West Campus. Eastgate and Westgate form distinct terminal elements and between the two is an unevenly spaced line of intermediate landmarks composed of both existing and new structures. The wall-like quality of the southern facade of the Institute is strengthened although visual linkage under and between the new residential buildings, and also from the Great Court to the river, will prevent a sense of the nearby waterfront from being completely obscured from within the campus. Physical connection to the entire waterfront is improved and the northern boundary of M.I.T., though not as defined as its southern counterpart, does emphasize the visual relationship and connection to Cambridge.
Extensive open space with level ground surface. Boundary partly defined by structures and partly by tree planting.

Major space (closed, present quality and character to be maintained).

Minor irregular spaces with a central focus and dominated by strong vertical elements.

Major space with isolated or interconnected structures within. Distinctive landscaping and floor texture.

Minor irregular spaces, interconnected and linked to a central focus. The whole being dominated by vertical landmarks.

Small interconnected spaces of similar quality and clearly defined by 6-8 storey structures. These spaces serve as courts and are paved and landscaped.

Linear mall (Rondall Square redevelopment).

Strong spatial focus containing redeveloped subways entrance (part of Rondall Square redevelopment).

This area will become a new central focus for the whole campus (see visual form diagram). This area should contain a tall vertical element like a campanile or observation tower. Alternatively, a lower visually strong element could be located here but one which is visually memorable, e.g. a fountain, distinctive sculpture, or a dramatic space for community activity.
2. **General Spatial Texture**

   As a supplement to the Visual Form Diagram and reinforcing the main design intent, the spatial texture drawing prescribes the pattern and character of internal and peripheral open space as well as the general structural massing of M.I.T. The quality of the spatial grain within each visual district of the campus is annotated. Both this drawing and the main form diagram convey a simplified impression of the structural fabric of the future campus yet with building articulation undefined and formal elements devoid of precise designation.
3. **Components of the Total Visual Structure**

The intention of this drawing is to subdivide into appropriate physical units the whole area affected by the main design proposal. This is essential where detailed visual policies are necessary and also when a program of sequential development is anticipated. The boundary of the subdivisions may be determined by the various functions of the relative component parts of the Institute, or in areas where there is a rich aggregate of activity, the divisions may occur along cleavage lines in the spatial texture. The unitary breakdown adopted in this proposal is a combination of the above methods. For instance, area B contains recreational, community and residential uses yet in terms of visual and perceptual form it can only be adequately subjected to design prescription if regarded as a composite unit. Conversely, area I is functionally homogeneous yet not necessarily visually distinctive from either area H or J. One of the main purposes of this drawing, and the previous one affecting the spatial texture, is to insure the ultimate visual coherence of the campus and to prevent an environmental entity such as M.I.T. from being composed of a series of visually disjointed and unconnected districts.

In a final planning statement, which would include a detailed building program and space requirements, a list of critical visual decisions and considerations
should be made for each area. Refinement of this nature is beyond the scope of this study and such information, affecting fragments of the campus, will only become available as specific areas are designated for actual development.

4. **Alternative Site Concepts for Key Areas**

The detailed design latitude which the main form diagram and the spatial texture drawing provide is used as a framework within which alternative site and architectural arrangements may be presented. A few schematic alternatives of this type, from which more complete architectural statements may be derived, are included here. The studies illustrated do not represent all the areas outlined on the previous drawing (Fig. 13). Rather only critical fragments, in terms of the evolving visual structure of M.I.T. are presented. These include areas A, B, D, and G as designated by Fig. 13, and are intended to show that the broad general design for the campus will permit flexibility of visual form and expression at a smaller scale.
ALTERNATIVE SITE CONCEPTS

area A

Separate, unconnected structures differentiated in terms of form, massing, texture and materials. Additional structures shown here include the proposed Graduate Center and the Indoor Skating Rink as well as a renovated commercial area on the site of the present Coop. Spatial form is fluid and a distinctive floor texture and landscaping unifies the area.

Differentiated, interconnected structures, well defined external space open to Mass Avenue. Uniform architectural expression and treatment in low connecting elements.

active frontage

clear view

view under
part area B
(charles river facade)
residential units

differentiated, individual structures
linked by external pedestrian system.

monolithic, highly articulated form.
(uniform height, texture and materials)
internal pedestrian circulation system
with linkage to external walkways.

individual units linked by low
structures housing internal circulation
and community facilities such as
dining, recreation rooms etc.
area D

non-directional tower landmark (15-30 storeys), with low rise buildings at the base.
This is an appropriate form for Westgate or Eastgate.

Curvilinear slab (15-30 storeys) orientated towards the academic area of the campus. The structure acts as a terminal screen to the Institute. Low rise elements at the base create a transition in form and architectural expression between academic and residential buildings.
area G

Alternative Site Concepts in this area are limited due to the definitive nature of proposals.

Single open clearly defined space containing tall vertical landmark (Earth Sciences Bldg.), courtyard differentiated in surface texture and articulation from adjacent spaces. Landscape layout emphasizes geometry of the main space.

courtyard space broken up by projecting structures. Floor texture and treatment carried to adjacent spaces and secondary courtyards. Tree planting further contributes to the spatial complexity of the area.
5. **General Visual Policies and Architectural Criteria**

The final category of the visual form proposal is the policies to be adhered to over the period of physical development until 1985. It is necessary that these policies be consistent with the broader design intentions of both the Visual Form Diagram and the General Spatial Texture drawing. Many of the policies here stem from problems and confusions discovered during the original survey of the campus. In this respect attempted corrections are suggested for the existing perceptual form. Additional policies aim at creating a well structured and meaningful environment for the whole extent of the area as outlined in the form proposal.

The supportive visual policies are categorized by a broad functional division based on circulation, open space, and building components. Although the listed policies apply primarily to the category in which they appear, there is considerable overlap and frequently, for example, a policy concerning the circulation system will also have implications for building form and general spatial quality.
Circulation System

(a) Both the internal and external pedestrian circulation system should be clearly and continuously structured and the principal movement paths of this network should be visually differentiated from minor and secondary feeders. This differentiation should primarily be in terms of space and volume and should be further strengthened by a distinctive floor texture. In addition on internal routes a special and continuous color treatment should be designed for the walls flanking the principal corridors.

(b) Where possible the main pedestrian ways of the campus should have visual access to some of the principal activities of the Institute or at least to a symbol of them. Long corridor walls may be punctuated at certain key points to expose scientific apparatus or laboratory and teaching activity. At a larger scale, and from the main vehicular routes which pass near and through the campus, strong views of M.I.T. activity and of the physical character of the environment should be provided. For example, the community precinct should perhaps be opened up to Mass. Ave., Main St. should be visually linked to the East Campus academic area and from Memorial Drive the linear form of the M.I.T. facade, and the sequence of activities it unfolds, should be clearly presented.
(c) Overall pedestrian movement should be contained by a single identifiable system. Outdoor and indoor connections should be clearly structured by a continuity of visual treatment or by a definite transition element such as a stairway, bridge, ramp, entrance canopy, or arcade. This system should be designed to eliminate orientational confusions, and occasional reference maps or some other device must be provided to enable exact locations to be determined. Vertical connections within the internal corridors should be visually emphasized. Vehicular access to and within the campus must have points of clear visual linkage to the pedestrian system.

(d) The long internal corridors of the East Campus should be designed with small rest areas immediately adjacent to the movement system. Spatially these areas may be regarded as part of the corridor. They should be developed as foci for casual social contact and should contain some furniture elements. It is important that wherever possible these rest places have views to the outside. Additional uses for such areas may be as visual portals to academic departments, or as display spaces for notices and minor exhibitions.
(e) In view of the hectic sense of pace and activity which seems to pervade the Institute, the corridor system should provide occasional access to areas of quiet and seclusion. These may be internal courts, roof terraces or insulated rooms for study and meditation.

(f) The main internal corridors should be visually terminated by a positive element. For example, this could be achieved by a powerful piece of sculpture, a distinct space housing temporary exhibitions (perhaps of scientific objects), or a dramatic view to the outside.

(g) The outdoor pedestrian circulation system should be constructed to minimize exposure to severe climatic conditions. Design methods using arcading, screen walls, tree planting and landscaping must be incorporated into the main design and handled in such a way as to integrate visually with the general character of the campus.

Open Space

(h) Adequate areas of open space should be located near the main pedestrian system on campus, and also adjacent to or accessible from, intense foci of indoor activity. These areas may take the form of small recreational units such as tennis courts, or simply be paved and landscaped courts.
(i) The open space district for recreation on the West Campus is to be preserved throughout the entire period of the present visual proposal. Views from this area through to the community precinct and to the high landmarks of the East Campus beyond, are to be maintained as much as possible. Visual connection from the area to the 77 Mass. Ave. entrance and to the river should be preserved and further developed.

(j) Devices for modifying the climate in the main open spaces should be investigated. For example, in the Great Court and the area around the Earth Sciences Building, screens for winter protection and awnings for summer conditions might extend the period of usage of these and other important outdoor foci.

(k) Indoor spaces should be made more pleasant and comfortable to sit in (e.g. the entrance hall to Building 7). The quality of some smaller outdoor spaces should be improved to be more inviting (e.g. the Hayden Library Court). A study is needed of both communal indoor and outdoor spaces to determine the present pattern of usage and how it can be further developed and improved.
Building Components

The following items are presented here as visual policies for the main building components of the Institute. When posed as questions, however, they may be regarded as architectural criteria for testing any proposed building unit within the generalized framework of the total design.

1. The main building components of the Institute should have clarity of visual form and the general nature of their internal spatial arrangement must be expressed on the outside. For example residential blocks predominantly contain many small individual units and this can be expressed on the elevations. Academic and teaching facilities, requiring flexibility of interior space, will result in a different form of external expression. Where possible internal activities should be exposed to the outside or at least some clue as to their general nature made evident.

2. The overall disposition of the principal building components of the campus should be well related in terms of physical and visual access to both the pedestrian and vehicular circulation networks. Entrances to each component part should be visually emphasized and where possible the front facades should face the principal external circulation.
Within each structure the internal spatial arrangement must be clearly communicated and floor numbers as well as individual room units must be vividly marked and easy to locate. Many detailed techniques may be used in carrying out this policy such as a special color coding for each floor or significant area, providing a conspicuous and well designed building directory at each principal entry point and at vertical circulation elements.

Each principal building component and area of the campus should have a coherent textural quality in terms of both building material and color. It seems that the trend at the moment is for most residential structures on the West Campus to be primarily of brick, while the academic district, originally of gray limestone, is now experiencing new construction in matching concrete texture. Also the community precinct is composed of structures of differing form and textural quality. Kresge Auditorium is a concrete shell, the M.I.T. Chapel is a brick drum and the new Student Center is a well articulated rectilinear pre-cast concrete structure. This trend should be maintained wherever possible. Precise functional determinants will undoubtedly demand exceptions to this, but as a general policy it should be continued.
At night a symbol of the M.I.T. campus must be illuminated in addition to the Central Dome. The residential areas because of constant occupation will be lighted at night and so too will the community precinct to some degree. At the moment, however, a prominent visual landmark such as the Earth Sciences Building becomes plunged in darkness in the evenings. This can result in apparent incongruity of total form and image. The lighting of such a building, from the outside, would not only help create a visual impression at night consistent with its daytime form, but would also communicate to some extent the general character of the academic structure of the Institute. Thus certain important forms, especially those like the Earth Sciences Building which convey the technological nature of M.I.T., must be illuminated.

All of the main components of the proposal from the visual form diagram to the detailed policies must be regarded together as an overall control instrument and as a background for design review of numerous building projects and environmental treatments. The testing of the validity or appropriateness of part or all of this visual proposal cannot be thoroughly undertaken without the actual implementation of at least several major projects. The main design
could be generally tested against basic environmental objectives but this would be a very approximate estimate and would only indicate apparent effectiveness.
CONCLUSION
This study has attempted to make a visual form proposal for the M.I.T. area. It is a special kind of planning statement involving prescriptions about the general perceptual character of the environment. Basic planning decisions about the Institute have been assumed in order to create a framework within which the qualities of the visual aspect of a total planning problem may be emphasized. Throughout the study an underlying premise has been that the perceptual function of M.I.T. should be considered as important as characteristics of land use and circulation.

It seems that planning only emerges in situations where excessive pressures are manifest and control becomes vital. In this respect the future form of M.I.T. conforms to a classical planning situation where an existing environment must be physically expanded and at the same time internally rearranged.

The final visual form statement presented here evolved from two basic information sources. The first was the visual survey which identified the overall physical structure and form of M.I.T. and ascertained its principal problems and potentialities. The second main source, which contributed to the making of the proposal, was handled in a more general manner. From assumptions based
on a broad discussion of alternative physical form layouts and siting arrangements for the Institute, a definite pattern for future growth was adopted. The visual form diagram 1985 incorporated both information sources and also attempted to satisfy certain basic environmental objectives for M.I.T., discussed earlier in the text. The scope of the final statement ranged from extensive alterations and additions to the circulation system, and general building massing, down to detailed visual policies affecting the interior arrangement of building units.

Perhaps the most obvious disadvantage of this kind of study is the inability to effectively test it. As mentioned earlier, only through the rigors of actual development could the effectiveness and ultimate quality of this proposal be estimated. This applies mainly to the overall design concept. Many of the more detailed visual policies could be implemented and tested within a relatively short period. For example those connected with orientation and way finding could be tested by both mass and selective interviews. Others such as the use of internal and external spaces could be appraised by observational checking over time. The main design concept of M.I.T. as a visual entity within the urban fabric, structured around a central activity spine and flanked by landmarks would take a much longer period to be realised
and evaluated. Throughout the evolution of the design a system of visual control and review would have to be efficiently practised to ensure overall success.

General weaknesses in the proposal as presented here can also be enumerated. The most significant (mentioned in the Introduction) is the emphasis on visual considerations throughout, and the absence of other real constraints affecting planning and development. These include social, economic and internal political issues, and at a more operational level, factors affecting functional location, building requirements, land acquisition and re-location problems. Only when a visual study such as this becomes integrated within a broader array of planning considerations can its true role be determined.

Another disadvantage in the methodology of this study is that only one general form proposal was presented. This was due in part to the rather definitive nature of the assumptions concerning the future of the main functional components of the Institute. Although schematic visual form alternatives were considered in the study phase perhaps they should have been developed further and presented as part of the main body of the proposal. Such alternative presentations, however, would require a detailed knowledge of growth trends, current space and building needs, and long range estimates of total development before a general design form could be selected. It
was thought that the refinements of the principal visual proposal would only become apparent once the location of main growth was set. The special characteristics of any visual proposal from the principal form diagram to the detailed policies emerges once future development and function have been predicted, and preferred density and land requirements determined.

The main conclusion which this study draws is that the M.I.T. visual proposal is a method of guiding future physical form other than by the preparation of a normal site plan showing assumed building shape and detailed architectural form.

The final product is an open ended instrument and in its technical operation it must be flexible enough to permit more precise design alternatives to be generated and at the same time rigid enough to ensure overall visual quality. This has been demonstrated here. M.I.T. in the future, as in the past, will be subjected to several diverse architectural design attitudes. A framework, however, for shaping the whole system of structures, activities and spaces into a clearly visible interlocking network has been established.


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_ A Guide to Graduate Life at M.I.T.

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