

A Brief Architectural History of MIT

The following is excerpted from the 1988 publication *Art and Architecture at MIT: A Walking Tour of the Campus*, written by former List Visual Arts Center Director Katy Kline, which was published by the Committee on the Visual Arts, List Visual Arts Center at MIT. The first version of this publication (November 1982) was published with support from the National Endowment for the Arts and the MIT Council for the Arts.

Introduction

MIT today is a sprawling but self-contained urban complex encompassing 136 [now 168] acres and 100 [now 158] structures that are functionally distinct but frequently interconnected. The architectural density and expanse of the present ensemble gives the visitor little hint of the sweep of vacant tidal flats that characterized much of this low-lying Cambridge tract only a hundred years ago.

The Institute was established in 1861, and after temporarily holding classes in the Mercantile Building in downtown Boston, was first housed in a single structure on the other side of the Charles River in the Back Bay. It was conceived by its founder William Barton Rogers as "a Society of Arts, a Museum of Arts and a School of Industrial Science." Nevertheless, though it collects art, the Institute does not possess Rogers' Museum of Art.

The campus is both vast and visually complex; its development and expansion on the Cambridge side of the river over nearly 70 [now 90-plus] years has resulted in a virtual compendium of many of the issues, attitudes, and personalities of twentieth century architecture. This is not an exhaustive architectural history, but rather an accounting of how the Institute and its architects have responded to the task of providing academic, laboratory, and social facilities in a highly specialized community. Those areas of campus that clearly represent varying approaches to design have been singled out for discussion, as have buildings that lay special claim to attention. We recommend a visit to the MIT Museum and Historical Collections that are housed in Building N52 (once the Cambridge Motor Company) at 265 Massachusetts Avenue. Along with historic photographs, paintings, documents and scientific instruments, the collections include instructive vintage views of the Institute of yesteryear.

Whether to uproot MIT from Boston and transplant it to more accommodating terrain became the subject of serious discussion early in the last century. By 1902, the combined student and instructional population had reached 1,500. The Institute, primarily a commuter school, had no dormitories. Crowded and unable to grow at Copley Square, MIT needed a new campus. A number of locations in the Boston area were considered, including one fanciful proposal for a man-made island in the Charles River.

In 1904 expansion plans were temporarily entangled with a proposal to merge the Institute with a newly endowed Department of Engineering at Harvard, but the MIT community voted overwhelmingly to remain autonomous. The search for new territory proceeded with an invigorated sense of communal purpose and identity.

Richard Cockburn Maclaurin, MIT's sixth president, visited Boston in 1909 several weeks before his inauguration. It is said that he fixed upon the present site while dining at the house of Charles A. Stone on the river side of Beacon Street in the Back Bay. The complex negotiations that followed resulted in welcoming invitations by the Cambridge City Council, its mayor, and various civic organizations. MIT then proceeded to acquire 46 acres east of Massachusetts Avenue, extending from the railroad right-of-way behind Vassar Street to the Charles River.

The new properties had been marshland until the 1880s when real estate speculators sought to repeat the successful creation of the Back Bay across the river. They constructed a granite sea wall, began filling the marshes for fashionable townhouses, and laid out the broad esplanade that is now Memorial Drive. The financial panic of 1893, however, discouraged potential buyers, and improvement came to a halt.

The inappositely named Harvard Bridge, completed in 1890, turned Massachusetts Avenue into a major thoroughfare connecting Cambridge and Boston. Due to the presence of the railroad this part of Cambridge was attracting industry; to the east of MIT's tract lay several enterprises including a piano manufacturer, two ironworks, a printer, and several candy factories. Also to the east was the Kendall Square subway station, which began in 1912 to serve the Cambridge to Boston line. Along Memorial Drive to the south, the Charles River had been converted from tidal flats to a broad basin by the completion in 1910 of a dam that fixed the water level at nine feet above mean low tide.

Maclaurin had grasped immediately the advantages of the chosen location. "This site is ideal for the Institute's purposes," he explained, "near to the heart of things, wonderfully accessible from all points of the city and surrounding country and occupying a position that commands the public view and must command it for all time." His perception of MIT's destiny dictated that the campus would not turn its back upon the world in an attitude of scholarly seclusion.

Maclaurin, impatient to proceed with the building, lacked funds, owing to difficulties in selling the Institute's Copley Square facilities. It was then that George Eastman of Eastman Kodak entered the scene in the tradition of the *deus ex machina*. Learning of the Institute's quandary, he asked Maclaurin how much money would be

required to erect the new buildings. When informed of the sum of \$2,500,000, he nonchalantly, according to legend, drafted a check, asking only that his identity remain a secret. Thanks to "Mr. Smith," as Eastman was known until 1920, the Institute could begin to search for an architect.

At this time and until after World War I, there was common cultural agreement concerning the proper use of precedents in architectural design. Beaux-Arts classicism firmly dominated American institutional architecture. MIT's situation required a formal grand plan in the classic tradition, a dream commission for any architect.

John R. Freeman, MIT '76, a member of the Corporation and an engineer instrumental in the creation of the Charles River Basin, inspected soggy Cambridge properties and developed preliminary engineering studies. Then, stepping beyond the strict role of engineer; he ventured into the realm of design and proposed first "architectural details and outlines derived from Greek Classic style, which have satisfied the human eye for 2,000 years," and then connected buildings "avoiding to the maximum extent the need for men racing across lots, often scantily clad, from one building to another in Boston's raw climate."

At least two members of the architecture faculty advanced plans. One of them, Désiré Despradelle, the French-born senior design teacher from 1893-1912, produced a beautifully rendered scheme but died some months before the commission was awarded, presumably not, therefore, of disappointment.

The Corporation looked carefully for an architect who had demonstrated skills in the development of large sites. By January 1913 they had settled upon Cass Gilbert, MIT '79, known for his plan for the University of Minnesota as well as for the design of the United States Customs House in New York and the Palace of the Arts in St. Louis. But Gilbert could not agree on terms with the Corporation; he went on to achieve national prominence when his 60-story Woolworth Building rose in New York City. The Institute then promptly announced the appointment of William Welles Bosworth, MIT '89.

Bosworth, like the majority of architects who have designed for MIT, was a product of its own School of Architecture. He had supplemented his formal instruction by working as a draftsman in the office of H.H. Richardson, one of the nation's preeminent architects of the late 19th century. After graduation he entered the employ of Frederick Law Olmsted and participated in planning the Stanford University campus. Later he studied in London and, like many Americans of the time, at the École des Beaux-Arts in Paris. Returning to New York in 1900, he worked on the plan and served as resident architect for the Pan-American Exposition of 1901 in Buffalo. Bosworth then settled in New York and built a practice under his own name. He was a solid practitioner of sober architecture and was well prepared to undertake this major commission.

The spirit of Welles Bosworth still presides over the campus; the image he imposed upon it survives undiluted despite many later additions by other designers. There proved to be congruence between Freeman's original suggestions for continuously connected buildings and the concept of the "grand plan" to which Bosworth had been oriented by study and experience. These monumental schemes, organized on formal axes, had been characteristic of major student projects at the École des Beaux-Arts and of such American realizations as the Chicago World's Fair of 1893. They reflected earlier precedents such as the great ensembles of Versailles or the Invalides in France and the Escorial in Spain, where vast galleries are interconnected around symmetrically repeated courtyards, dramatically isolating long, controlled vistas across a contained and ideal landscape.

Between 1913 and 1916, under Bosworth's supervision, the Institute erected Buildings 1, 2, 3, 4, and 10, as well as Building 8, a convenient entrance to the east. Two symmetrical, flanking, stepped wings carve out a broad central court; the riverfront pavilions, like cupped hands, enclose two smaller courts along a perpendicular axis. The facades of the minor courtyards are designed as two-story buildings in which giant pilasters alternate with tall vertical windows below a fenestrated attic story. Another story is added around the major court. A stately rhythm builds up slowly from the extremities through a series of repeated elements: corners, pilasters, windows, and smaller columned porticos to the culminating central portico articulated by ten monumental Ionic columns and capped by a generous dome based on the Pantheon in Rome. The qualities of continuing space and of gradual progression toward the sky were recognized even at this early date as of critical importance to an urban campus.

The mood of the complex is dignified, imposing, and restrained. Unlike other ornate, bedecked Beaux-Arts extravaganzas, Bosworth's monumental edifice appeared to his contemporaries and remains today "severely simple." It eschews the dramatic lines and shadows created by the familiar device of a running line of repeated arches in favor of pure trabeation, or post and beam construction. Decorative carving is virtually non-existent; special significance is thereby assumed by moldings, profiles, shadows, and proportions. The tight sharp edges of corners and pilasters and precise bite of the incised monumental lettering, which catalogues a pantheon of great names in learning, contribute an invigorating charge. A single bold decorative statement was intended to be a monumental 50-foot statue of Minerva, the Roman goddess of wisdom, to stand in benign surveillance of the central court. Although Minerva never materialized, sculptures by Henry Moore (a bronze *Three-Piece Reclining Figure, Draped*) and Michael Heizer (a multipartite granite grouping, *Guennette*) articulate the end courts.

The architecture is abstract; exteriors do not give expression to interior functions. The limestone of the courtyard facades lightens any massive monumentality; its tone has dictated the choice of much of MIT's subsequent external materials for academic structures. (Bosworth, incidentally, claimed he had to insist upon

limestone. MIT had first envisaged expanses of the traditionally collegiate red brick, which today predominates on the western, residential, and recreational half of the campus.)

In consequence of the dominant line of approach, Bosworth's complex faces the world primarily in one direction. The orientation toward the Charles River Basin and Back Bay acknowledges the Institute's aspiration to "command public view for all time." The Great Court, renamed Killian Court in 1974 in honor of the Institute's 10th President, was originally conceived as the major place of arrival. Bosworth initially made efforts to connect it architecturally with water landings to strengthen the axial gesture toward Boston. But the automobile age was under way; Memorial Drive quickly became an expedient thoroughfare that did not lend itself to providing direct access. Bosworth's complex, as well as many subsequent MIT buildings, have visual frontage on the river but are cut off from it physically by a stream of auto traffic. The original network of formal paths has become a tranquil oasis of trees and flowering shrubs within the desert of urban pavement and, save during graduation exercises, it is not the busy ceremonial focus first envisaged.

These formal classical phalanxes have been subject to changes in appreciation over the years. Shortly after its completion, the complex was received as "sane, sober and beautiful." Yet Bosworth lived to see the Beaux-Arts mode fall from grace. As Eero Saarinen, a subsequent architect for MIT later remarked:

...these were the buildings that we all disliked in the thirties and forties because of their psuedo-classical sterility. But let us not dismiss them so easily because we once disliked them. One can see that they form a unity: they create an environment. They have also proven quite useful...Parenthetically the Bosworth MIT buildings have been called dull and monotonous, but I have come to the point where I welcome more dullness and more monotony in our Cityscapes instead of the visual clashes typical of our time.

Steen Eiler Rasmussen, Danish architect and teacher, found Bosworth's architecture too monumental and lifeless by day. In *Experiencing Architecture* he wrote:

MIT should be seen at night when it lies bathed in floodlights and the heavy limestone walls appear almost insubstantial in their ghostly whiteness. From the Boston side of the river it looks like a fairy palace with its mighty Pantheon dome, its colonnaded front and broad steps. Every night it looms up amidst electric signs and ordinary buildings like a monument of the past...

Though opinion occasionally has been divided on the aesthetic impact of Bosworth's buildings, their revolutionary importance for planning concepts within academic construction is uncontested. The continuously

linked system with its unit construction and non-bearing partitions allowed great flexibility. In the fast-moving world of science and technology research, priorities change and laboratories have a life span of approximately twenty years. For example, the Institute no longer requires steam laboratories: generations of wind tunnels and generators have become obsolete; today's chemistry laboratories bear little resemblance to those of the 1920s. Bosworth's building system has accommodated the shifting demands upon it, sustaining hundreds of interior alterations without violation of its exterior integrity.

Space had become a problem even before the new buildings were occupied. Discussions had started when enrollment stood at 1,500, and Bosworth had been advised to anticipate a student body of 2,000. But the population already exceeded 1,800 by 1915, and Maclaurin feared the 2,000 mark would be reached even before the buildings were completed.

Nevertheless, the Institute took possession of the new campus with appropriate panache in the fall of 1916. The President and Corporation carried the MIT Charter across the Charles in an ornate neo-Gothic barge replete with plaster nymphs and mermaids designed by Ralph Adams Cram of the School of Architecture. Bosworth's grand river-oriented axis justified itself at least for this ceremonial purpose.

Bosworth moved to France in the early 1920s to direct the reconstruction of Versailles, Fontainebleau, and Rheims Cathedral. Before his departure, however, he extended his indelible imprint upon the core of the main campus with several other structures: Walker Memorial (Building 50, 1917), the President's House (Building E1, 1917), and the Pratt School of Naval Architecture (Building 5, 1920).

Walker Memorial, the original student dining and recreational center, presents a robust face to the river. Its broad flight of steps recalls one of the architectural features from the Institute's earliest Rogers Building on the Boston campus. Although a curved portico was originally planned, the final flat portico keeps the facade in line with Building 2 along Memorial Drive. Walker's plain Pompeiian Doric columns, befitting a place of exercise and muscularity, are simpler and sturdier than the more delicate Ionic order Bosworth employed on the main complex.

Walker houses the first permanently installed work of art at MIT: the series of didactic murals by Edwin H. Blashfield, MIT '69. Blashfield was one of the most celebrated American muralists and teachers of his day, although today his symbolism appears somewhat dated in its earnest moralizing.

The President's (Gray's) House (Building E1 at 111 Memorial Drive) and the Senior House dormitory (Building E2) along Memorial Drive constitute Bosworth's easternmost outpost. The President's House, an austere version

of a Roman Villa, employs a graceful Pompeian Corinthian order and was appreciated at the time as expressing a "delightful balance of sobriety and lightness of touch held in fine reserve." Bosworth also designed the East Campus Alumni Houses (Building 64).

Although actually constructed after World War II, Hayden Memorial Library (Building 14) is closer in spirit and design to the adjacent monumental Bosworth complex than to the contemporaneous modern architectural idioms that would be developed in the northern sector of the campus. The Hayden Building was designed in 1950 by Ralph Walker, MIT '11 of the firm of Voorhees, Walker, Foley, and Smith. He conceived a simple rectangle around an intimate courtyard, in which are placed three major bronzes by Jacques Lipchitz that span the course of his career. The building's glass and limestone facades follow neoclassical rhythms and attempt to bridge Bosworth's vision and a somewhat more modern expression. On the riverside, elements of Bosworth's earlier stylistic vocabulary are reversed; windows are not recessed behind dominant vertical elements but rather protrude dramatically. Science, Music, and Humanities Libraries, together with the Institute Archives, occupy three wings of the structure and part of the fourth; the remainder of the last wing is the Elizabeth Parks Killian Hall for musical performance.

Bosworth lived to the age of 97, a convivial, active intelligence concerned with the fate of MIT's built environment for all but the last few months of his life. Even from afar he controlled campus development through most of the 1930s. He was personally responsible for the East Campus Alumni Houses from 1924 and the Homburg Infirmary (Building 11), the first extension to the rear of the main north corridor. Bosworth's grip on campus development culminated with the Rogers Building (Building 7, 1937), the main entrance on Massachusetts Avenue that identifies MIT for every taxi driver in Boston.

This final piece at the northwest corner of his original complex was designed in collaboration with Harry J. Carlson, MIT '92, a Bosworth disciple who appreciated the master's desire to provide "a noble entrance to a noble group." The main entrance was designed as a smaller version of the main portico; four round Ionic columns flanked by two square piers from the portico carry a simple entablature, cornice and attic, while behind perches a low dome. Ionic columns continue the exterior motif, rising three floors to articulate the lobby interior. Balconies at the second and third floors overlook the foyer. This imposing entrance is sometimes said to be Bosworth's revenge for the Institute's expropriation of space within his earlier Great Dome at Building 10. Constructed during the Depression, it seemed to some an extravagant gesture in a time of need. Shortly after its completion, the Institute Registrar is said to have grumbled that he could fit 37 bays of "useful" space beneath the cavernous dome. Despite its height and magisterial proportions, the entrance hall is, in fact, the liveliest spot on the campus, the scene of arrivals and departures, concerts, demonstrations, an annual engineered egg drop

and other contests, announcements, institutional morning coffee, a closed-circuit television screen, as well as the focal point for a biannual sunset observance.

The simplicity of Bosworth's corridors is unexpected after the grandeur of the Rogers entrance. Interior panels have few stylistic details; they are direct and functional. The colorfully painted walls that signal in chromatic sequence where one building segment ends and another begins were introduced by the Planning Office in the early 1970s for orientation and visual relief.

By 1921 MIT had grown to about 3,400 students and faculty, plus rapidly increasing administrative and custodial personnel. The post-war figures fell off for a while, climbed higher around 1930, then declined again during the Depression. But the latter decline occurred in response to hard financial times and it was assumed that the MIT community would grow again. Few non-academic amenities existed at the Institute; there was neither a separate auditorium nor a faculty club. Athletic facilities were improvised and outdated.

Concerned by the dismal condition of the athletic buildings and believing in the principle of *mens sana in corpora sana*, an alumni committee determined in 1937 to raise funds for a recreational center. Copies of the architect's rendering for this project survive in the Institute archives. The drawing by Eric Kebbon that was circulated to the alumni depicted a structure consistent with the style of Bosworth and sited according to his plan. One remarks upon the design because it never materialized and because it was the last gasp of Beaux-Arts classicism at MIT. The alumni envisaged both a new, large, multi-purpose facility as well as the remodeling of Walker, but the Depression cramped the fund-raising campaign. MIT therefore redefined the scope of the project and decided to build two small athletic units: a swimming pool and a field house. The architectural firm of Anderson and Beckwith was selected for the work.

Lawrence B. Anderson, MIT '30, and Herbert L. Beckwith, MIT '26, faculty members in the School of Architecture, represented a critical departure from the style of Bosworth. They belonged to the young generation of practitioners of the International Style of architecture, the modern movement that had taken shape in Europe but had not yet taken hold in the United States. The International School found metaphors in the clean, functional forms of industry: steamships, airplanes, grain silos; it celebrated the honesty of building materials and the massing of unadorned geometric volumes. Anderson had been the recipient of the coveted Pans Prize in 1930, which permitted him to study at the École des Beaux-Arts in Paris where Bosworth had studied before the turn of the century. But like many Beaux-Arts students of the era, Anderson drew substantially from an "underground" design curriculum, and both he and Beckwith had become aware of the European architects Walter Gropius, LeCorbusier, Gunnar Asplund, Wilhelm Dudok, and Alvar Aalto.

It would be difficult to over estimate the courage of the Institute's decision in favor of the modern movement. In 1938 there were few institutional buildings in the new idiom in the nation and none in the Boston area. If MIT's own faculty of architecture was beginning to incline toward a modern expression, the lay public, traditionally uneasy in the presence of aesthetic revolution, looked upon it with furrowed brow. No doubt the modern cause was helped at MIT by the need for athletic, rather than more formal, academic facilities. Nevertheless, the Institute acted boldly in turning away from a traditional collegiate architecture towards an investigation of contemporary architectural design.

The first Anderson and Beckwith building to be completed was Briggs Field House (W23, now demolished). The siting of this modern structure respected Bosworth's grid across the street: its simple geometric forms of brick and glass announced the advent of contemporary architecture. However, the design that most conspicuously marked the transition from neoclassical to modern architecture at MIT is the Alumni Swimming Pool (Building 57, 1940).

This unassertive but pleasing yellow brick and glass building has a huge south window that admits winter sunlight to the entire pool surface. The asymmetrical entrance on the west side is sensitively balanced and quiet. While achieving a strong expression of modern architecture at a difficult historical moment, Anderson and Beckwith did not declare war on the past. They respected Bosworth's materials and developed forms that could coexist harmoniously with existing and future structures. The swimming pool came to rest on the old track, northeast of the main building. The land before it lay vacant to Memorial Drive, awaiting a new gym. The north-south spine drawn by Bosworth was strongly suggestive, but the architects set the pool beside the axis rather than squarely upon it, engaging it with the entrance and offering expansion to the west.

World War II transformed MIT's intellectual program and, by extension, the face of its campus. The Institute engaged in some 400 defense contracts. The greatest achievements occurred in the Radiation Laboratory, which, at its peak, occupied fifteen acres of floor space in various locations in Cambridge and employed scientists, technicians, and support personnel numbering 3,900. While regular enrollment dropped far below 1930s levels, MIT was training 2,000 Army and Navy Officers per year in Ultra-high Frequency Radio techniques. Total community population reached nearly 10,000. Research contract activities created an unprecedented demand for floor space, with little time for reflection upon planning and architectural subtleties.

Buildings appeared on the main campus like mushrooms after a spring rain. Proceeding west from the swimming pool, one traverses Compton Court (so designated from the large Compton Laboratories for Electronic and Nuclear Sciences that define it on the west.)

The Karl Taylor Compton Laboratories (Building 26) constitute an introduction to the contribution made by the firm of Skidmore, Owings & Merrill to this northern sector of the campus under the 1960 area-planning concept, which assigned the development of different campus regions to individual architectural firms. The building was designed by Gordon Bunshaft, MIT '33 of Skidmore, Owings & Merrill, and completed in 1957. It is composed of three elements: a five-story box structure containing offices, laboratories, and classrooms; a low brick auditorium, constructed partly below grade, which extends into Compton Court; and a single-story glass-walled reading room. Compton exemplifies an architecture in which function has generated form. The exterior of each part expresses its use. Thus, for example, the auditorium is windowless, while the reading room is airy and light. In the principal section of the building, Bunshaft followed the example of the curtain walls of Anderson and Beckwith's 1952 Dorrance Building (Building 16). He raised the box off the ground on stilts to open a ground-level passage that facilitates outdoor circulation between Compton Court and Massachusetts Avenue.

Anderson and Beckwith's Building 24 (1941-42) was the first International Style office and laboratory building at the Institute. The design of bands of glass between columns and spandrels of yellow brick, though unassuming in detail, did look toward the kind of leisured appreciation possible in some eventual peacetime. Buildings 24, 31, and 12, the latter two the work of Carlson and Coolidge, a firm whose design lineage was directly traceable back to Bosworth, respect the original axis. They each manage to articulate well with the main group as well as to suggest an organization of the otherwise crowded back court, a diverse assembly of earlier architectural hands and epochs.

The rear of the Great Dome and Building 4 represent original Bosworth; Guggenheim and Sloan Automotive Laboratories (Building 31) were the work of Carlson during the '20s; Anderson and Beckwith later remodeled and expanded Sloan. Building 17, with the curious roof visible from the upper floors of nearby buildings, is the Wright Brothers Wind Tunnel. Designed by Jackson and Moreland in 1938, it houses a low wind-speed facility for testing the designs of aircraft and high-rise buildings. Anderson and Beckwith's Building 24 and Coolidge and Carlson's Building 12 date from the war years. The Compton Laboratories and the Sloan Metals Processing Laboratory (Building 35), designed by Robert C. Dean MIT '26, of Perry Shaw, Hepburn, Kehoe & Dean, represent the 1950s.

The hand of Skidmore, Owings & Merrill is detectable in a series of structures along Vassar Street. Walter Netsch, MIT '43, best known as the architect of the Air Force Academy Chapel in Colorado Springs, directed the SOM design team for the related research facilities of Buildings 36, 38, 37, 39, 13, and 9. Netsch developed the Vassar Street perimeter, placed the Bush Building (Building 13 Center for Materials Sciences &

Engineering) in the interior of the campus parallel and adjacent to Bosworth's east-west corridor and filled in the gap on Massachusetts Avenue.

The Fairchild Buildings (38, 36, 1972) and the prismatic plug between them (Building 34, 1983) finally assembled in contiguous structures electrical engineers and electronics research groups that had been dispersed throughout the Institute.

Passing through SOM's 1968 Information Processing Center (Building 39), one encounters Netsch's Bush Building (Building 13, 1965). Buildings 37 and 39 are architecturally similar to the Bush Building though they rise one story higher. Bush abuts the rear of the dome and honors Bosworth's five-story scale. Netsch used an exposed concrete frame with dramatic, large, and darkly recessed windows. He set the building on columns to create a ground floor portico. The building's sensitivity to its somewhat cramped and overpowering surroundings was commended as "an expression of modest architectural good manners in a classic setting" by a national award jury in 1967.

Perhaps Netsch's most taxing assignment was the Center for Advanced Engineering Studies (Building 9, 1967). This compact structure negotiates the difficult transition between Carlson's Guggenheim Laboratories and the Rogers Building. Netsch chose to insist upon the connection rather than conceal it. He repeated the limestone facing and observed the rhythmic elements of the earlier classical buildings, but gave emphasis to the new link by breaking the roof profile as well as the line of the street facade.

The second architectural firm assigned an area-planning role in the intensive building program undertaken in the 1960s was that of Ieoh Ming Pei, MIT '40. Pei's sector, however, was defined at the outset on the north by the long rectangle of the Center of Life Sciences, the Dorrance and Whitaker Buildings (16 and 56, respectively). Dorrance was built in 1952 just two years after the Hayden Library Building inaugurated the expansion of academic facilities on the main campus. Designed by Anderson and Beckwith with a gleaming curtain wall, it reasserted the modern idiom that the architects had first expressed in their Alumni Pool. This laboratory was first conceived as a long five-story building, but then was both truncated and heightened so that the Pool would not be deprived of its solar access. The later addition of Anderson, Beckwith and Haible's Whitaker Building (1963), however, undermined this concern, confronting the quadrangle with a northern edge rather higher than the adjoining buildings.

The choice of materials in Dorrance and Whitaker figures significantly in declaring the liberation from earlier tradition. After designing a link to Building 8 in the familiar tones of yellow brick, the architects turned to glass and steel instead of limestone to achieve an image of precision and transparency that both complements and

contrasts with the grave solidity of Bosworth and his disciple Carlson. The slimness of the slab building form reinforces the impression of weightlessness.

It was in this context that Pei introduced his plan for the Eastman and McDermott Courts that he implemented with the Green, Dreyfus, and Landau Buildings. Pei had moved far from the studios of Building 7, where in 1940 he prepared a thesis entitled "Standardized Propaganda Units for War Time and Peace Time China." In Boston, he and his firm were the architects of the Christian Science complex, the John F. Kennedy Library, and the glass-walled Hancock Tower, which casts its shadow over Copley Square where "Boston Tech" once resided. He has designed several museums including the highly publicized new wings of the National Gallery in Washington, the Boston Museum of Fine Arts, and the entrance courtyard at the Louvre in Paris.

The first and most visible and controversial of Pei's designs is the Green Building or Center for Earth Sciences (Building 54), completed in 1964. This tall, leggy structure on heavy piers violates two of Bosworth's original cardinal principles. Standing boldly alone in the center of McDermott Court, it asserts its independence from the hallowed MIT traditions of continuously attached buildings, although it maintains underground connections with Whitaker and Dreyfus. The open ground floor emphasizes this break in the linkage system.

Second, in rising to 300 feet and 22 stories, it vigorously challenges the low horizontality that heretofore had defined MIT's physical extension. The architect deliberately sought the "leadership" of a tall tower that could provide an organizing focal point for the diverse and disorganized group of buildings surrounding the court, somewhat like a flagpole in a public square.

Yet, despite its authoritative independence, the Green Building does respect Bosworth's classical mode. The reinforced exposed concrete duplicates closely the texture and color of the original limestone. The building exhibits a rigorous symmetry and relies on a modular system close in proportion to Bosworth's own. Finally it employs regularly repeated areas of dark recessed glass, in this case bronze solar glass, between vertical columns.

The building dominates the eastern end of the main campus and has assumed the stature of a new MIT landmark. Its aggressive authority has been admired, but other critics have called it "blunt and spartan" and point out the inevitable but awkward disparity between the purity and monumentality of form and the busy "ephemeral antennae" of the meteorological equipment scattered over the roof. There also have been ground level problems: winter winds swirl about the open entrance loggia and interfere with easy access. Pei returned to the Institute's customary five-story height for the Dreyfus Chemistry Building (Building 18, 1969), joined to Whitaker at a 90-degree angle by passages above the ground level, a means of linkage that eased exterior

circulation and created longer sightlines. By contrast with MIT tradition, Pei's designers wrapped the building around artificially illuminated laboratories, so as to facilitate variations in the size of research groups and meet the technical requirements of the exhaust and other mechanical systems.

Pei's final work in this sector is the triangular Landau Chemical Engineering Building (Building 66, 1967). The triangular form results from an accommodation to two different site geometries, and the treatment of the form is sculptural. Landau acts as the eastern terminal of the Institute's continuous corridor system. Pei has carved an opening through the tip of the wedge, a symbolic gateway to the main campus from Ames Street.

The prow of the Landau Building points across Ames Street to Pei's most recent work at MIT, the Wiesner Building. This interdisciplinary complex houses teaching and research activities in the Media Lab, as well as public exhibition programs in the visual arts at the List Visual Arts Center.

With exceptions, the Institute's other possessions on the East Campus are recyclings of commercial-industrial structures, an expedient that MIT adopted well before the current trend for such conversions.

The Psychology Building (E10) and the Seeley Mudd-Horace Sayford Ford complex are two particularly successful renovations. In the former instance, Marvin Goody, MIT '51 confronted a 1912 concrete frame factory building that already had endured one transformation into a scientific instrument company. Goody liked the building frame and industrial glazing, but the Psychology Department's programmatic requirements ruled out large window areas. The architect therefore replaced the glazing with painted-brick infill and narrow windows, painting the exterior so as to emphasize the old frame. Though Goody's color scheme has not been followed to the letter in subsequent repainting, the windows accent the framing.

Goody, John Clancy, MIT '56 and Associates converted E17, a former chocolate factory, into the Seeley Mudd Center for Cancer Research, the Arteriosclerosis Center and Cell Culture Center. Rogers Associates were the architects for the conversion of Mark Linenthal's original 1920 Ford Building (E18-E19), now devoted to clinical research and administrative offices.

Near Kendall Square, the School of Management and the Faculty Club (E52) occupy the former Lever Brothers headquarters at 50 Memorial Drive, altered for Institute purposes by William H. Brown, MIT '33. The original architect Donald des Granges happened to be an MIT alumnus, class of 1914, under the spell of Bosworth. The architecture of his building bears a strong affinity with Bosworth's work upstream, with the addition of telltale 1930s stylistic details such as the rounded corners on the entrance bay.

The Cambridge firm of Wallace, Floyd, Ellenzweig, and Moore renovated the adjacent E51, a commercial structure from the 1940s. Its elevated enclosed bridge connects it to the School of Management, which shares the facilities with the Program in Science, Technology, and Society.

Examples of original, as distinct from recycled, east campus construction are the Grover Hermann Building (E53, 1965) and the Whitaker medical complex. The imposing Hermann Building, a social sciences and management research center, shares the Sloan Plaza. It is the design of Eduardo Catalano, an Argentina-born architect, for many years Professor of Architecture at MIT. Among his designs outside the Institute is the Julliard School at Lincoln Center in New York. The Hermann Building relies on a bold use of concrete by which the top floors protrude over the lower two. Two years later Catalano further demonstrated his virtuosity in concrete with Eastgate (E55), the disciplined 33-story residential tower demarcating the Institute's eastern frontier at Kendall Square.

The master plan for the east campus was assigned as a joint venture to Gruzen and Partners-Mitchell/Giurgola. Their scheme is designed to connect and integrate the previously disparate main and Sloan campus sectors. The third original east campus building is their collaborative 1981 Whitaker College of Health Sciences, Technology, and Management Building and the Health services: Building (E25 and E23), a large bipartite structure that explicitly avows its double function. It recalls several traditions in MIT building: a dominant horizontality, the importance of the point of juncture between autonomous units, and the progressive stepping of the roof line toward a light filled culmination, in this case an atrium rather than a dome. The two quasi-independent wings of the large "L" meet within the narrow atrium space; the dramatic obtuse angle defining the northern interior facade of the medical ESI wing resonates with the angled lines of the Landau Building visible across Ames Street. The building cannily adjusts the orientation of this eastern corner of the campus to Bosworth's original axis running under the main dome. The broad exterior expanses of red brick, a material previously restricted to the recreational west campus, is enlivened by the optical patterning of lighter buff-colored accent blocks around the serial window openings.

Within the broad angle formed by the two wings of the Whitaker Complex stands the modernist aluminum-skinned grid of the Wiesner Building (E15, 1985). In a pioneering application of the MIT policy that since 1968 has stipulated that one-percent of the construction or renovation costs of an Institute facility be designated for the acquisition of art work, three noted contemporary artists were commissioned to collaborate with architect I. M. Pei on the design of the building. Sculptor Scott Burton devised the interior seating, balustrade, and stairwell. Painter Kenneth Noland conceived the interactive color bands that enliven and articulate much of the building's surface. Environmental sculptor Richard Fleischner was responsible for the two-and-a-half-acre

exterior site, designing the patterned paved paths, plazas and stairs, as well as the grading, planting, lighting, and seating.

The far-sighted acquisition of acreage across Massachusetts Avenue in 1924 facilitated the distinction between the main campus as locus of academic and intellectual activities and the western sector, which was devoted to student amenities.

The aggressive volumes and portentous overhangs of the Stratton Student Center (W20) identify it as the work of Eduardo Catalano, the Argentina-born architect previously encountered as the author of the east campus Hermann Building. The Center, from 1965, filled a long-standing need for student recreation facilities and houses dining halls, student organization offices, and function rooms as well as a host of other services.

Catalano is known for the dramatic use of cantilevers, which exploit the structural and expressive potential of reinforced concrete. He deploys his materials in an attempt to exploit illusions; the heavy mass of the upper portion of the building appears to defy physical laws by floating on glass and has led an occasional uneasy spectator to feel that the building is upside down. Stratton Center is not bashful architecture; its admirers find confirmation of the architect's desire to assert the airborne spirit of his times by flaunting gravity in the risky upper stories' overhang. To others, however, its heavy-browed massiveness asserts the very gravity and oppressive weight that it was intended to deny.

Like most other Institute architects, Catalano acknowledged the presence and symbolic significance of the original Bosworth building. He wrote:

...this main building has a voice of seniority—by age, by dimensions, simplicity and location. Its huge dome, a symbol of compression, represents the elder brother, heavy-shouldered, thoughtful, downward-looking, a witness of the past; while the structure of the Student Center, with its large cantilevers, a symbol of tension and defiance of gravity, represents the younger brother looking upward, optimistic, witness of the present.

Renovations to the Stratton Center are the work of the Cambridge architects Bruner/Cott.

The Student Center Plaza affords a sweeping view of the billowing curves that characterize the distinctive work of Eero Saarinen, one of the Institute's most significant contributions to 20th century architecture. In the early 1950s the Institute planned to place a long-sought auditorium, for which funds had finally materialized, as part of the "dormitory row" along Memorial Drive, on the site presently occupied by Anderson and Beckwith's McCormick Hall. Saarinen, Finnish-born and one of the most acclaimed architects of the post-war years, was

commissioned to design the new building and argued persuasively against the Memorial Drive location. His architecture, such as the TWA Terminal building at Kennedy Airport in New York or the vaulting stainless-steel Gateway Arch in St. Louis, was a relentless search for expressive forms, which he called "plastic shapes." Convinced that these shapes would be out of keeping with the other stolid buildings fronting Memorial Drive, he argued persuasively for moving Kresge Auditorium to the interior of the west campus. Rather than challenge the Rogers Building entrance on Massachusetts Avenue, he placed his Kresge Auditorium (Building W16) off-axis. Saarinen began to play with variations on a dome, a practical means of enclosing both an auditorium and a small theater and as a tacit acknowledgement of the classical geometry generated by Bosworth's domes. The architect remembered how one solution, an eighth of a sphere set on three points, seemed at first "a vulgar freak... but after seeing it for three or four days it became the loved one." It is even said that, in a three-dimensional rendition of an architect's traditional and spontaneous "napkin sketch," Saarinen carved a grapefruit served to him at breakfast to articulate the shape he wanted. The dome itself is a steel and concrete shell poised gently on three pendentives plunging to the steel supports on the ground. Glass walls descend from this structure to the ground. Kresge divided opinion. Bosworth, predictably, could not abide it and did not return the compliment that Saarinen had made him. "I for one," he remarked uncharitably, "don't think Saarinen's originality, his weakness, is as important as beauty." But Edward Weeks, former editor of *The Atlantic* and a Harvard alumnus envious of MIT's facilities, called its illuminated form the "opal on the Charles."

Saarinen acknowledged the influence of his architect-father Eliel in the design for the small but elegant non-denominational chapel: he drew both its cylindrical shape and encircling moat from the elder Saarinen's chapel for Stephens College in Columbia, Missouri. The attitude has still deeper roots in Scandinavian romanticism. The circular form not only pays homage to the long history and symbolism of centralized religious structures, but also sets up sympathetic reverberations with the curves of neighboring Baker House and Kresge.

The MIT Chapel (Building W15) is built of coarse water-struck red brick, with unevenly shaped and spaced arches at the bottom of an exterior shell that rests on a small pool. An interior brick shell undulates against the outer wall allowing the shimmering light reflections in the water to enter from below and play on the wall, except during winter freezes. Two sculptors, Harry Bertoia and Theodore Roszak, collaborated with Saarinen. Bertoia's open fret screen of slim metal rods and cross plates is suspended from ceiling to floor behind the altar and further scatters broken light patterns. Roszak's *Bell Tower* perched atop the cylinder is composed of three smooth vertical thrusts rising from the encrusted arches of the base, symbolizing the history and authority of three major religious persuasions.

MIT's claim to Memorial Drive as a residential strip had been established with the purchase of two former apartment-hotel complexes: Ashdown House (N1, built in 1900 and purchased in 1937) and Burton House

(W51, built in 1927 and acquired in 1947). But the first original west campus MIT construction for student housing and, in the opinion of many, MIT's finest building in any category, is Alvar Aalto's Baker House (W7).

Aalto, a Finnish pioneer of the modern movement who had come as a visiting professor in the School of Architecture in 1940, was commissioned to design an undergraduate men's dormitory on the river edge. He responded with the romantic, brick, serpentine structure named in honor of Everett Baker, a beloved Dean for Student Affairs who had worked for an improved student environment until his untimely death in an airplane accident. Completed in 1949, Baker House is one of Aalto's rare works outside his native Finland; the only others in the United States were his library at Mt. Angel Abbey, St. Benedict, Oregon; a conference room in New York City; and a small library room at Harvard.

Baker House is a complex but eminently approachable building. Unlike the stricter geometry of much advanced architecture of the modern period, it does not declare itself immediately. It reserves a certain initial mystery; neither side provides any clue as to the appearance of the other. Particularly sensitive to site, Aalto allowed the river to determine the striking form of the building. He is said to have asked his students, "When you stand by a river and look, which way do you stand? Do you stand square in front? No, we look upstream or down. So, we shall do that in our building. The rooms will look upstream or down."

The serpentine curve that resulted had the practical advantage of allowing the greatest number of interestingly shaped rooms while avoiding the creation of both tedious, deadening corridors and the second-class quarters that often plague a traditional or echelon plan. Aalto described his plan as a contradiction of the "powerful and inhuman monotony of the ground plan of a normal American city with its checkerboard netting."

The main entrance of the building is from the north and is off the normal perpendicular axis. The stream of students approaching the dramatic vertical "V" of the cantilevered double staircase divides like a river reaching its delta. The monumentality of the large structure is softened by the deliberate texturing of the surface with a coarse clinker brick, as well as by the reddish brown color, sympathetic to the neighboring tones of Ashdown and Burton Houses and warmer than the chaste white exteriors that often characterized the International Style.

All of the Baker House furniture was designed by Aalto with the collaboration of his wife, Aino. They helped to create an ensemble of unusual aesthetic quality. This remarkable building created a new context for thinking about dormitories at MIT and influenced subsequent university residential architecture. Rasmussen, who came to know Baker House well while a visiting professor at MIT wrote of it in 1957:

Aalto has created a building which entirely avoids the stereotyped rooms and ant-hill atmosphere of old-fashioned dormitories, and the students love it. He has sought to give each one a chance to exist as an individual as well as to lead a corporate life. In Baker House the students can gather in large groups as well as in the lounges on the main floor and in smaller groups in the common rooms on their own floors. Or they can retire to the privacy of their own rooms which, like all parts of the building, are so very human because their design was based on the life that was to be lived in them. Behind the undulating facade the rooms could not be uniform.

The eminent but crusty architect Frank Lloyd Wright had a less charitable opinion. In 1952 he wrote "...Aalto's work on MIT affects me as inspirational as a clumsy grub. No chrysalis is that dormitory of his. But I like him."

In response to continued pressure for student housing, dormitories now extend in a continuous row along Memorial Drive, rounding the far western corner of the campus. MacGregor House (W61, 61A) by Pietro Belluschi and The Architects' Collaborative in 1970, and Sert-Jackson Associate's sprawling stretch of undergraduate accommodations—West Campus Houses of 1975 (W70) and their 500 Memorial Drive (W71) completed the unbroken chain along the river edge.

The far western residential end of the campus was nailed down by Westgate (W85), a married-student housing complex, and by the 24-story Tang Tower (W84, 1972), both by Hugh Stubbins and Associates. This latter vertical focal point sets up a distant antiphonal echo with Catalano's tall Eastgate on the eastern tip of the campus.

The athletic complex originally had belonged exclusively to Anderson, Beckwith, and Haible (who joined the firm as partner in the late 1950s); the now demolished Briggs Field House (W23) whose simple geometry in brick and glass had announced the advent of modern architecture to the Institute; Rockwell Cage (W33) from 1948, shaped by the availability of war-surplus trusses transported to Cambridge from Virginia; and the Dupont Athletic Center (W31-32), wherein the old (1902) Cambridge City Armory was pressed into Institute service in 1957.

The Johnson Athletics Center (W34) was designed by Davis and Brody and completed in 1980. This authoritative brick, glass, and glass block structure fulfills the architects' avowed and self-imposed charge to achieve "more than jock-ville" by paying intelligent attention to its architectural context in terms of color, surrounding textures, and rooflines. The considerable second-story mass, comprising a 50,000-square-foot field house, is lifted above a smaller volume on cruciform piers. Their strong vertical thrust is extended into the expanse of facade by subtle striping achieved through quiet variations in the size and alignment of the bricks.

The muscular exterior stairs acknowledge the bold sculptural cascading stairs on Alvar Aalto's nearby Baker House dormitory.

From the original small, single-structure, Boston-based commuter school, MIT has become a specialized heterogeneous community. Its tightly organized environment must sustain round-the-clock physical activities in a variety of domains: experimental, intellectual, social, and recreational. Rapidly approaching the saturation of its available spaces, the Institute confronts its perpetual and acute planning challenge, the furnishing of a master plan with sufficient muscle and flexibility to accommodate both current and as yet only emerging demands. Fortunately the Bosworth complex, which first welcomed the Institute to Cambridge and whose columns and domes have come to serve as symbols of its public image, continues to provide an admirable paradigm of handsome, considered design at the service of farsighted planning.

Postscript:

To meet the changing needs of teaching and research, the Institute has added a remarkable array of new facilities designed by distinguished architects. These include Simmons Hall (Building W79), an undergraduate residence designed by Steven Holl and Perry Dean Rogers and Partners; the Zesiger Sports and Fitness Center (Building W35), designed by Kevin Roche, John Dinkeloo and Associates and Sasaki and Associates; the Ray and Maria Stata Center for Computer, Information, and Intelligence Sciences (Building 32), designed by Gehry Partners LLP; and a Brain and Cognitive Sciences complex (Building 46) designed by Goody, Clancy & Associates and Charles Correa Associates. MIT gained additional dormitory space with the renovation of NW30, (now the Warehouse graduate dormitory) at 224 Albany Street by S/L/A/M Collaborative in 2001 and the construction of housing for the Sidney Pacific Graduate Community at 70 Pacific Street (designed by Steffian Bradley Architects, Inc.) in 2002.

Completed in the fall of 2007 is an “infill” building within the main group of Bosworth buildings that is designed to provide significant infrastructure renewal and modernization. The cornerstone of the project is the Green Center, named for Cecil and Ida Green.

The School of Management’s new home, located just to the east of the current MIT Sloan headquarters at 50 Memorial Drive, will extend from Memorial Drive to Main Street and will serve as an eastern gateway to the MIT campus. It is scheduled for completion in 2010. Also in construction is a graduate residence complex that will expand the northwest sector of MIT’s campus housing quarters, which is to be completed for occupancy in the fall of 2008. Scheduled to begin construction in the spring of 2008 is a new cancer research facility, which will be located next to the David H. Koch Biology Building and across from the Eli and Edythe L. Broad Institute.

For additional information, please visit the *The Evolving MIT Campus* website at web.mit.edu/evolving/.