RICE UNIVERSITY

Campus Planning
from
COMPOSITION TO INFRASTRUCTURE

by
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ABSTRACT

Historians classify American higher education into four periods: The Colonial college era to the Revolutionary War; the growth of colleges; industrial revolution and the expansion of colleges into universities; the scientific era; and the broadening scope of higher education.

In terms of origin, planning process and form, however, institutions of higher education in the United States can be classified in three groups: Institutions which originated as colonial colleges and later on developed into universities; Post-Revolution colleges and universities; and the New Universities of the 1960's.

The purpose of this thesis is to study campus planning as it has developed from the colonial period to our present time. Planning method and form is studied through case studies that examine the process of establishment and growth. The method of planning of each example is then evaluated in relation to its response to changing circumstances. These circumstances are the result of specific
external changes occurring in society and their impact on the university's scope, size and method of teaching.

The development of American Campuses from the self-sufficient college buildings of Colonial era to the formal composition of the Post-Revolution campuses is studied in chapters I and II. The new circumstances affecting universities' mission is studied in chapter III. Chapter IV examines the impact of the new circumstances on the physical form of the new universities. It also studies the concept of planning in these universities as it developed from individual buildings as units of organization to an organizing device, based on infrastructure.

The formal plans of the Post-Revolution campuses were formulated in response to the existing demands as well as a projection for the future based on the present circumstances. As circumstances changed the master plan became detrimental to the accommodation of new demands. This thesis demonstrates that the new universities which followed this traditional method of planning became the victims of the same mistake.

To accommodate present demands as well as unperceived future circumstances, the emphasis in campus planning must shift away from buildings to an open ended infrastructure.
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I COLONIAL COLLEGES
COLONIAL COLLEGES

Colonial colleges were founded through the determination of the early settlers to preserve the Old World intellectual and cultural traditions, and through their desire for literate clergy and a body of orthodox lay professionals. The lack of sufficient funds and the vastness of the new country thwarted the early settlers' desire to emulate the Cambridge and Oxford central university model. Instead, between 1636 and 1780, nine colonial colleges were founded.

The colonial colleges were usually very modest both in terms of physical facilities and staff. The entire staff of a college sometimes consisted of a clergyman and his wife. Two tutors and a professor made up the whole faculty of Princeton until 1820. In 1857, a graduate of Yale, looking back at his school days remembered: "The freshmen recitation rooms were furnished with three rows of benches, were lighted with oil lamps, were occupied by a needy student as his rooms when not used by a class for recitation, and were cheerless and uncomfortable." (1)

The colonial colleges usually originated with a single building sited on an open landscape. With no significant planning, additional buildings were constructed as need
arose and funds became available.

The Old College completed in 1642, was the first college building constructed at Harvard. The New College of 1674 and Stoughton Hall were later additions. The Old College is a significant case to study since it was the first college building constructed in the English Colonies. Its form and architecture influenced the architecture of many colleges that were erected afterwards in the colonies.
THE OLD COLLEGE OF HARVARD

A firm determination for the revival of English culture and traditions in the colonies and the desire for learned clergymen as well as leaders with a broad education motivated the puritan immigrants to establish the first college in the English colonies.

Process and History

On October 25, 1636, the General Court of Massachusetts passed the legislative act that founded Harvard College. The Court agreed to pay £400 toward the establishment of a college. £200 was to be paid in the following year and the rest at the completion. This was "the first official and recorded step toward the establishment of the earliest collegiate foundation in the English Colonies." (2)

The institution used to be called "Colledge" until March 13, 1639, when the court ordered that the school be called "Harvard Colledge", honoring John Harvard. Before his death in 1638, John Harvard by his oral will contributed one half of his property plus his library of 400 volumes to the college. On October 20, 1637, a committee of six magistrates and six ministers was appointed by the General Court as the first Board of Overseers to carry
out the order for the establishment of the college.

New Town (today's Cambridge) was voted to be the site for the college. In selection of the site, the Board of Overseers rejected Salem's offer of a three hundred acre tract. It was situated on the borders of Marblehead with an ocean frontage of a quarter-mile. The Board chose, instead, a "house and a lot measuring slightly over an acre among the cowyards of Cambridge." (3) Behind this decision was the intent to help New Town. New Town had been abandoned by Massachusetts as the colonial capital and was losing its population by immigration to Connecticut. Early in 1638, the college purchased Peyntree House and its one acre cowyard.

Theophilus Eaton, one of the important Puritans who sailed to Boston in the summer of 1637, was selected as the president of the college. Master Eaton held his first recitation class for the first year freshmen in Peyntree House after the completion of its remodeling in August of 1638. His presidency, however, lasted not more than a year. He fled the country when his mismanagement of students was discovered. The college remained closed until 1640, when Henry Dunster of Cambridge, England, was appointed by the board as the new president.
The construction of the first building designed especially for the college started in 1638. The building was originally known as Harvard College or, simply, "the college." In 1652, after the Goffe House was acquired, it was called "the Old College." Dunster's first goal was to complete the construction of the Old College as soon as possible. Only a few students could be housed in Peyntree House. The rest, as he stated, "were dispersed in the town and miserably distracted in their times of conourse." (4)

Concept

Dunster's idea of a real college, which was also shared by the founders of Harvard, was modeled after that of the English colleges: "A Society of scholars, where teachers and students lived in the same building under common discipline, associating not only in lecture rooms but at meals, in chambers, at prayers, and in recreation." (5)

This concept led Master Wilson, a member of Harvard Board of Overseers under whose direction the Old College was planned and construction begun, to produce a plan based on the concept of English Eton College which he had attended.
Form

The building was built on tract I - the first site purchased in 1638 - on the north side of Peyntree House. An "E" shaped building, the Old College was a three story structure which accommodated for all educational facilities as well as housing and food services both for students and for their masters.

The first floor consisted of porch, hall, kitchen, larder or pantry room, buttery, cornroom, two chambers, and studies.

The building had two major entrances on the north-south axis and two service doors to serve the kitchen and the cornroom. Entering the building from the south, one would first enter an enclosed porch, appropriate for the cold weather of New England. The porch would lead into a passage with the hall on the right side, the four story turret containing stairs and studies in front, and the entrance to the buttery and passage leading to the kitchen and the cornroom on the left.

The hall, a large rectangular room with a large fireplace, functioned as a space for common lectures, chapel, dining room, and for any other event involving a large gathering.
THE OLD COLLEGE PLAN

Second floor

First floor
Chambers functioned as dormitory rooms and contained studies. Studies were closet-like rooms, assigned one to each student. They provided a place for reading, writing, and storing books and personal belongings. These small spaces provided privacy of study within a community of living. Each had a window and non-structural wall that could be taken down for additional room in the chamber.

The buttery contained rows of country cheese, loaves of bread, of butter, and a barrel of college beer. It was a lounging place for masters and the privileged fellow commoners.

The second floor housed a library, five chambers with studies and two cabins. Reaching the second floor from the turret, one would enter the Great Long Chamber with sufficient room for 12-15 students. The library was on the east and the cabins, each containing two beds, on the west side of the long chamber.

The third level contained two chambers in the wings with two studies, while the front section was allocated for expansion.

The Old College had a timber frame covered with wood siding. The building has a steep-pitched roof with fourteen gables, covered with cedar shingle. The interior wall
surfaces were plastered and the building was very modestly furnished.

The four massive chimney stacks projection out from the center of the building exhibited the simple order of the interior spaces and held the composition together.

"What beauty the Old College possessed came from its sincere adaptation to the use expected of it. Like all medieval buildings, it was dynamic rather than symmetrical; the builders decided what room they wanted and enclosed it in the simplest possible way." (6)

The Old College was completely abandoned and deteriorated by 1676. In 1652 Goffe House was remodeled to facilitate additional space. Following the example of the Old College in form, without any overall campus plan, the "New College" was constructed in 1674.

All of Harvard's seventeenth century buildings have been destroyed either through deterioration or fire. Massachusetts Hall (1720) is the oldest building on today's campus.

The first college building at Yale was designed by Henry Caner, under the influential leadership of Gordon Saftonstall who selected New Haven as the site for the college.
Nassau Hall (1784) is the first building Princeton contributed to colonial college architecture. The Georgian style of this structure influenced the form of many three to four story college buildings to follow.
FOOTNOTES


3. Ibid., P. 6.


## ILLUSTRATIONS

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II POST-REVOLUTION UNIVERSITIES
POST-REVOLUTION UNIVERSITIES

The major differences between the colonial campuses and the post-revolution campuses is the evidence of premeditated planning in the latter. The planning, however, consisted of composing individual buildings to form quadrangles, courts, vistas, and other popular compositional orders of the time.

Since individual donors contributed toward the construction of each building, usually one at a time, this concept of planning was comparable with the method of financing of future expansions of the campus. This method of planning, however, was basically a response to the existing demands and the institutional scope as well as a projection for future needs based on present circumstances.

Usually, as circumstances changed the master plan became detrimental to the accommodation of new demands. The completed quadrangle and symmetrical composition did not lend itself to further growth. Furthermore, the eclectic form of the buildings were not compatible with the program of the new functions they were to house.

The mid 19th century industrial revolution, the technological and scientific advancements are some of the circumstances that influenced the mission and size of the
universities. While the old master plan of the university became detrimental to the accommodation of new demands, new plans, which in turn became inappropriate in a few years were juxtaposed against the old ones. This process created a chaotic condition of traffic, services and relationship of activities in a historic museum of architectural styles.

One of the major issues in planning up to World War II was the selection of the "proper style" for the buildings. The donor's and college president's tastes determined the styles selected. Neo-Georgian, the style for most colonial colleges, was used in some post-revolution colleges as well. Thomas Jefferson, who disliked Georgian architecture, introduced classical forms in his 1818 plan for the University of Virginia. The first Gothic building in the United States was erected by Bishop Chase: Seeking aid for the construction of his Ohio seminary, Chase journeyed to England where he enlisted the aid of two benefactors. Along with the donors, he visited Cambridge. The three chose Gothic as the style for the college. In 1827, he named the college after one (Lord Kenyon) and the town in which the college was located after the other one (Lord Gambier).
The public supported the Gothic style as a more appropriate form for educational institutions, considering it less pagan, a form symbolizing their churches and schools.

The Union College in Schenectady, New York, is a significant campus to study since it is the first institution of higher education in the United States that was constructed according to a campus plan.

Duke University is the second Post-Revolution campus to be studied in this chapter. It demonstrates some of the growth problems created by the formal plans of this period.
THE UNION COLLEGE

Process

The plan for The Union College was prepared in 1813, by Joseph Jacques Ramee, a Parisian architect, who sailed to America in 1811, to serve as the architect for David Parish, an international financier.

Ramee was commissioned by the president of Union College, Eliphalet Nott, an ingenious inventor, preacher, educator. Nott left the school a $600,000 in endowment.

Form

Ramee's plan was a symmetrical composition of six buildings, three of which are linked by a U-shaped colonnade, surrounding a pantheon in the center. The other two, North College and South College, form an open court. The open court was a rejection of the "monastic self-containment of the Oxford and Cambridge traditions. In a gesture of extending opportunity for all, the architect established a rectangular court of honor, flanked on both sides by two buildings which housed students and teachers." (1)

The North and South Colleges were constructed during the presidency of Eliphalet Nott. The Pantheon was built
THE UNION COLLEGE PLAN

A. Jackson's garden
B. South College
C. North College
D. The Parallel buildings
E. Pantheon
F. Schaffer Library
in the latter part of the 19th Century. The last building of the Union College plan to complete the architectural composition of 1812, was completed in 1962. Schaffer Library with an eclectic form was designed to resemble Ramee's original form in spite of the incomparability of today's library program with the historic form designed one and a half centuries ago. This is a contradiction to Ramee's progressive views and concepts.
Schaffer Library
Completed in 1962
Duke University
DUKE UNIVERSITY

History and Process.

Duke University goes back in its origin to 1835 when the institute was founded in Randolph County, North Carolina, by the Methodists. In 1851, the institute first accepted state funds and became Normal College; the first teacher training institute in America. In 1859, its name was changed to Trinity, and it became a Methodist-sponsored liberal arts institution.

The agricultural depression of the 1870's along with the poverty of the Reconstruction Era reduced the enrollment and the prestige of the college. These factors resulted in decreasing income for the institution. Financial problems became crucial in this period and reached their peak in 1885 when it was proposed that the college's property be sold.

In search of a solution to keep Trinity in existence, President Crowell during his second year of office in 1888, suggested the relocation of the college from "the village into the stream of a city." (2) In 1889, the board of trustees discussed this suggestion and voted for its adoption. Meanwhile, several cities expressed their
interest; among them Raleigh, Greensboro, and Durham. Bids were taken from the cities. Raleigh offered $35,000. Against this offer, Washington Duke, a wealthy tobacco manufacturer of Durham, stated that he would equal Raleigh's offer and add $50,000 more for endowment. Duke's offer was accepted and in 1891, a charter authorized the move.

The land, the site of the present East Campus, was donated by General Julian Carr while Washington Duke contributed funds for the first building and endowment. Construction on the new site started with the Washington Duke Building, a Georgian brick structure. Crowell initiated the construction of the Technology Building to commemorate his wife who died in 1888.

The construction of the College Inn started with a $15,000 additional gift from Duke. In the summer of 1892, the college moved to its new location. New buildings were built and Trinity College expanded as funds were donated. In 1895, Ben Duke donated $5,000 for the construction of the chapel and a hall for large gatherings. In the same year, the trustees pledged $3,100 for improvements of the "campus grounds." In 1898, Washington Duke announced a second gift of $100,000 and followed it by
another $100,000 in October, 1900. In 1903, the Library was constructed with gifts from Mary Duke. Many other donors aided the growth of the campus. The most significant aid to Trinity College was the establishment of the Duke Endowment on December 11, 1924, by James B. Duke which made possible the expansion of the institution to a university. Trinity College changed to Duke University.

Form
The First Plan - The East Campus

The campus was developed according to a master plan. The plan consisted of a series of buildings symmetrically arranged around a landscaped space to form a long mall along the north-south axis. A relatively large scale domed building on the north end of the mall is the focal point of the composition. According to the master plan, all the buildings are constructed with brick in Georgian style.

The post World War I increase in enrollment, the expansion of the college into a university, along with the institution's new goals and economic assets required a major expansion of the physical facilities. The composition of the Georgian Mall, however, was complete, and its further expansion was not possible.
DUKE UNIVERSITY PLAN

1. Gothic West Campus
2. Georgian East Campus
The Second Plan – The West Campus

For further expansion, the University acquired a new site one mile west of the existing campus. Horace Trumbauer, a Philadelphia architect was asked to prepare a plan for the new campus. Trumbauer's solution was a composition of Gothic buildings forming a large quadrangle. The main element of this plan was the University chapel with its high and dominant Gothic tower. The chapel was located on the west while other buildings were arranged on both sides to complement and further enhance the form of the chapel. The construction of the West Campus started around 1927, and students moved into the new facilities in 1930.

The technological and scientific advancements of the 1930's and the introduction of new disciplines into the university were not followed by any changes in the building forms of the original master plan. Instead, new functions whose programs were not compatible with the old eclectic forms were forced into the pre-conceived Gothic buildings. The last Gothic building to complete the quadrangle was completed in 1953. A study of this campus prepared by Caudill, Rowlett and Scott in 1963, states: "The buildings were designed from the outside in, striving..."
more for beauty than for function and economy. The goal was realized. The central spaces have few peers in collegiate planning for beauty and order. But minimizing the functional aspect has made necessary extensive renovation or planned renovation of almost all the original buildings at an exorbitantly high cost." (3)

The Third Plan

The tremendous enrollment growth of the 1950's and 1960's, the University's new scope and purposes, and the introduction of specialized new disciplines into the institution necessitated further expansion. The Gothic quadrangle was already completed, and its further expansion was not possible. A new generation of buildings had been erected near the road linking the two campuses together on the northwest section as well as other sections of the vast landscape. This pattern of growth created a great hodge-podge of traffic and interrelationships among the different elements of the University.

It was time again for another master plan. Several architects and planners were interviewed and in 1963, the architectural and planning firm of Caudill, Rowlett and Scott were selected to prepare a new plan for the University. Their study of the campus stated:
"One of the most challenging problems has its roots in the division of the campus and the abundance of land available at its western extreme. The unlimited area for growth has led recent development into a pattern of dispersal which poses serious problems of pedestrian circulation, academic isolation, and loss of unity... The formal quadrangle does have the disadvantage of becoming complete, and thus difficult to expand. The original buildings, although of high quality, have not lent themselves well to conversion to modern needs. And, of course, there is the ever-growing parking problem." (4)

The new plan proposed clusters of individual buildings mostly sited in an area between the two old campuses, an attempt to unify the campus.

The Union College and Duke University demonstrate some of the problems created by the formal plans of the Post-Revolution campuses. Universities which implemented their original plan many years after its formulation had to force the new functions into the pre-conceived eclectic form of buildings designed many years ago. On the other hand, the completed court and quadrangle which were planned in response to the existing demands and institutional scope did not lend themselves to further growth
and the accommodation of new needs.
FOOTNOTES


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III THE NEW CIRCUMSTANCES
THE NEW CIRCUMSTANCES

Scientific and technological advancements, urbanization, along with the international scientific race increased the demand for higher education. These circumstances, on the other hand, influenced the method and scope of higher education as well as the relative size and form of the new campuses.

Scientific and Technological Advancements

The scientific techniques of seed and fertilizer improvements, insecticides, and new agricultural machinery, have made it possible to produce a large quantity of foodstuff with fewer people involved in farming. At the beginning of the Civil War, eighty per cent of the population of the United States was involved in farming. This figure has declined to five per cent in 1970.

The declining job opportunity in rural areas and increasing industrialization created great migration to urban centers. The complexity of urban life, sophistication of techniques and the declining market for unskilled labor created an accelerating demand for education.

Alvin Toffer in Libraries points out that scientific
knowledge is doubling every ten years. Ever-expanding knowledge contributes to more specialization and creates further demand for higher education.

International Scientific Race

Special interest in scientific research increased after World War II. When advancement in science led to the splitting of the atom, nations decided their security rested in rigorous scientific research. Strong nations became involved in an incredible scientific race. "In the United States federal expenditure for research and development increased over 200 times from 1940 to 1964." (1) The belief that the larger the number of educated citizens in a country the stronger and richer it would be, along with the fact that investment in scientists and engineers would lead to more production of goods and higher GNP created great interest in education.

Government saw education as the path to prosperity and power. President Lyndon B. Johnson in 1965, urging businessmen to support expenditures for education, pointed out that on the average a college graduate earns $300,000 more in his lifetime than a man with an eighth grade education.
Prosperous citizens mean a prosperous country. On the other hand, advancement in technology and industry is very closely related to the expansion of education. The greater the number of educated citizens and the vaster the pool of scientific knowledge, the greater the possibilities of technological and industrial progress.

President John F. Kennedy, in a message to Congress in 1963, stated: "This nation is committed to greater advancement in economic growth, and recent research has shown that one of the most beneficial of all such investments is education, accounting for some forty per cent of the nation's growth and productivity in recent years. In the new age of science and space, improved education is essential to give meaning to our national purpose and power. It requires skilled manpower and brain power to match the power of totalitarian discipline. It requires a scientific effort which demonstrates the superiority of freedom." (2)

The Government's Interest in Higher Education

The federal government's interest in higher education started as early as 1787. That year public land was made available for public institutions of higher education.
The Morill Land Grant Act of 1862 and the second Morill Act in 1890 provided more effective regulations for land grants, as well as funds to support the instruction of certain subjects in colleges.

The Hatch Act of 1887 and the Smith-Lever Act of 1914 established Agricultural Experiment Stations and Agricultural Extension Services.

"During World War I, the ROTC program was established. During the Great Depression, universities were involved in the programs of the Works Projects Administration and the National Youth Administration. During World War II, universities participated extensively in the Engineering, Science and Management War-Training Program inaugurated in 1940. In that same year, the National Defense Research Committee (later, the Office of Science Research and Development) was established. After World War II and again after the Korean conflict, the 'G.I. Bill' and the corresponding bill for Korean veterans sent a seismic shock through academic life." (3)

Although federal interest in higher education has a long history, it intensified drastically after World War II. Higher education in the academic year of 1969-70 received $5.0 billion from the federal government. (4)
Thus, substantial federal funds became a major factor in the operation of many universities as well as in the establishment of new institutions.

The Increase in Demand

Technological and scientific advancements as well as governmental support of higher education increased the demand and accelerated the growth in enrollment in institutions of higher education.

The immense growth in the percentage of the college age population going to college manifested increasing demand for higher education. The percentage grew from 7.1 in 1900 to 31.1 in 1970. (5) The rate of increase in the enrollment of graduate students was even faster than that of undergraduates. "Enrollment of undergraduates increased from 231,761 in 1900 to 3,235,000 in 1960, or fourteen fold; of graduate students from 5,831 to 332,000 or fifty-seven fold." (6)

In the fall of 1970, there were 7,612,000 degree credit students in the institutions of higher education in the U.S.A. (7) This is more than three times that of 1950 and 27 times that of 1900.

Expenditures for higher education increased from $46
million in 1900 to $27.2 billion in 1970, or 591 times. (8)
In 1970, population was only 2.5 times that of 1900 (9),
and GNP 50 times greater than that of 1900. (10)

According to the calculations of economist Peter F. Druker, the facilities required to accommodate the 12 year enrollment growth in higher education between 1963 and 1975 are equal to twice all of the facilities constructed during the last 300 years.

This growth, although the most significant one, was not unique to the United States. Most other countries had an impressive expansion in their higher education.

From the end of World War II to 1962, Great Britain's universities had doubled their enrollment. By 1967 twenty-four new institutions of higher education received charters, were constructed and opened their doors to new students. The 1970 enrollment surpassed the earlier forecast of 170,000 and Lord Robin's October 1963 report on higher education in Great Britain recommended an increase to 560,000 students by 1980. (11)

In France, 14 new institutions were established between 1958 and 1963. Further expansions were planned to meet the increase of the 1950 enrollment of 192,500 to 505,000 by 1970. This was accommodated with provision of
700 teaching and administrative positions. (12)

Other European countries as well as industrializing countries of Asia and South America had significant expansion plans for higher education.

Scope of Higher Education

The growing democratic trend, the industrial revolution, and the scientific era changed the scope of university education as well as the relative size of campuses.

The single introverted community of master and a few elite students pursuing moral philosophy changed to a university containing many communities, each pursuing a diverse subject with closer links to daily life and open to eligible students of all walks of life.

At the end of the first half of the 19th century, Cardinal Newman, opening the University of Dublin, stated: "Knowledge is capable of being its own end. Such is the constitution of the human mind, that any kind of knowledge if it really be such, is its own reward... useful knowledge is dead trash." (13)

This concept of university education could not remain isolated from outside influences. With growing social demand for knowledge, the concept of knowledge for its own
sake was supplemented or in some cases transformed to knowledge for achieving social goals.

In 1930, Flexner speaking about the "Idea of a Modern University" with its professional schools remarked: "A university is not outside, but inside the general era...It is not something apart, something historic, something that yields as little as possible to forces and influences that are more or less new. It is on the contrary an expression of the age, as well as an influence operating upon both present and future...Universities have changed profoundly and commonly in the direction of the social evolution of which they are part." (14)

Circumstances changed faster than attitudes toward the scope of universities. While Flexner was writing about the "Modern University," it in turn was changing its direction. Flexner complained that universities were becoming too many things. Speaking of Harvard's Graduate School of Business, he complained that universities are becoming the "service station for the general public."

The university, once a single isolated community, had changed to several communities on the periphery of society. Now it was moving rapidly toward the center and was becoming more complex and diversified. Flexner's "Modern
University" was moving toward Clark Kerr's "Multiversity". In his book *The Uses of the University*, Kerr points out: "The idea of a university was a village with its priest. The idea of a modern university was a town - a one industry town - with its intellectual oligarchy. The idea of a multiversity is a city of infinite variety...As against the village, and town, the 'city' is more like the totality of civilization as it has evolved and more an integral part of it, and movement to and from the surrounding society has been greatly accelerated. As in a city, there are many separate endeavors under a single rule of law...The multiversity is an inconsistent institution. It is not one community but several - the community of the undergraduate and the community of the graduate, the community of the humanist and the community of the social scientist, and the community of the scientist, the communities of the professional schools, the community of all the nonacademic personnel; the community of the administrators. Its edges are fuzzy - it reaches out to alumni, legislators, farmers, businessmen, who are all related to one or more of these internal communities. As an institution, it looks far into the past and far into the future." (15)
The 19th century Morill Acts and the post World War II federal support of scientific research in universities are two of the major motives that accelerated changes in the scope of American universities.

The 19th century land grant was a response to the industrial and agricultural development. Through research for technical advances in farming and manufacturing as well as training, the universities were to assist this development and ultimately the economic and political sectors of the whole society.

The land grant movement created schools of agriculture and business administration. It established agricultural experiment stations as well as service bureaus in the universities, and extended the gate of opportunity to the children of farmers and workers.

The post World War II federal support of higher education and its special emphasis on research had a much stronger impact on the scope of university education. It created many new fields of study within the universities, expanded research, graduate and post-doctoral training, helped the acceleration of enrollment growth, linked the university closer with industry, business, and government agencies, created a new independent class of faculty
members who were in the center of social and world affairs and made education a significant force in the economic growth of the nation.

The high priority for scientific research in universities created a new balance between humanities and sciences, graduate and undergraduate studies.

Seventy-six per cent of the $1.5 billion in federal aid to institutions of higher education in 1960 was spent on research, while only six per cent was allocated for social sciences and hardly any for the humanities. This was an impetus to the expansion of graduate studies in scientific fields. It also brought very specialized branches of engineering, physical and chemical sciences to the campuses.

The faculty member, with his increasing research opportunities, new incomes and new affiliation with outside agencies found a new sense of independence. He found research more challenging than teaching. Teaching was increasingly conducted by assistants and non-faculty members, and research professors became more administrator than teacher. There was less contact between students and the professor, and new methods were used for increasing the efficiency of teaching.
The growing demand for higher education and its continued support from industry, business, and government brought a six-fold increase in the enrollment in institutions of higher education in the last thirty years. This incredible growth became a force in the economic growth of the nation. According to Fritz Machup's calculations, the production, distribution, and consumption of knowledge in all its forms in 1960, accounted for about twenty-nine per cent of the GNP of this nation. Its growth rate is about twice that of the rest of the economy. "It has been estimated that over the last thirty years, nearly one half of our national growth can be explained by the greater education of our people and by better technology, which is also largely a product of the educational system...What the railroad did for the second half of the last century and the automobile for the first half of this century, may be done for the second half of this century by the knowledge industry; that is, to serve as the focal point for national growth, and the university is at the center of the knowledge process." (16)

Change in Method

The incredible growth in the number of student was
not met with the same growth rate in teaching positions. This shortage had to be met by teaching innovations.

Many industries competed for a better mechanical system of collection, storage, retrieval, and distribution of information.

The American Telephone and Telegraph Company in 1966, published an advertisement concerning such devices. Under a map of the United States, the ad said: "It can be just one big campus, linked by a Bell system...A Bell system network of transmission facilities can provide flexible audio-visual aids for any group of colleges and universities. Taped and live television programs can be transmitted simultaneously to classrooms on one campus or many. Mutual programming between colleges and universities, linked together by the Bell system, gives more opportunities to share professors and other resources. And there is another Bell system 'audio-visual' aid called Tele-Lecture. This two-way amplified telephone service allows widely separated audiences to hear a lecture, then participate in question-answer sessions with the speaker. Tele-Lecture service can also be adopted to specific needs such as group conferences and seminars, as well as for credit courses and lecture. Each of these Bell system
audio-visual aids has proved to be a low-cost method of expanding educational programing." (17)

The shortage of qualified teachers and the search for a better and more efficient method of teaching led many campuses to equip themselves with new technological devices. Many schools taught with films, closed and open circuit television, planned and built clusters of large classroom-buildings equipped with electronic devices, scheduled classes with computers, and examined and graded students by mechanical devices.

Although universities have been going through drastic changes since their establishment, their present forms, scope, and functions are not going to remain the same. They will change at a greater rate. "The task of prophecy is made difficult by many internal and external cross-currents to which universities are exposed." (18)
FOOTNOTES


2. Ibid., P. 6.


5. Ibid., P. 66.


16. Ibid., P. 87, P. 88.


IV THE NEW UNIVERSITIES
THE NEW UNIVERSITIES

In response to the pressures on higher education of new circumstances, a new type of university appeared in the 1960's. These new universities were planned, constructed and developed into mature universities in a relatively short period of time.

The new universities were founded through a different process, and in response to demands different from the traditional ones. Seeking to devise appropriate responses to the new circumstances, they departed in different degrees from traditional universities in their academic planning and methods of teaching, their scale, density, organization, and their form.

The new universities were mostly financed with federal and state funds. The funds were available to construct significant amounts of the campus during one construction phase.

Both academic organization and teaching methods were oriented toward high efficiency of means. The large number of students and the shortage of qualified teachers led to the use of new educational technology. Large auditoriums and lecture halls were constructed, and space planning innovations were devised.
THE NEW UNIVERSITIES

CHICAGO CIRCLE CAMPUS
20,000 students (1961 Plan)
24,000 students (1965 Plan)
Gross density 226 students per acre
Distance from city center:
1 mile

SCARBOROUGH COLLEGE
5,000 students
Gross density 100 students per acre
Distance from city center:
20 miles

BERLIN FREE UNIVERSITY
3,300 students
Gross density 137 students per acre
Distance from city center:
6 miles
DUKE UNIVERSITY
7,100 students (1970)
Gross density 7.1 student per acre
Distance from city center:
3 miles

A POST-REVOLUTION UNIVERSITY
The new universities had urban densities and larger scale than traditional campuses. Their new scale was the expression of their high enrollments. Many of them had opening-day enrollments the size of a mature university. This enrollment, furthermore, doubled in a very short period of time.

The forms of the new universities were not eclectic, but were an attempt to accommodate the present functions with some degree of flexibility for future changes.

The various new universities employed different concepts of planning. There seems to have been a chain of development in departing from the traditional model of planning towards a more appropriate solution in light of the new circumstances. Three of the schemes most significant for their responses to the new demands are chosen to be studied in this chapter. Chicago Circle Campus, the first case, with individual buildings as units of organization is in the United States. Scarborough College, a linear scheme, is in Canada. Although several linear campuses were constructed in the United States, Scarborough was selected because of its higher level of development. Finally, Berlin Free University was selected for its unique concept of grid as organizational
device.
Chicago Circle Campus
CHICAGO CIRCLE CAMPUS

Although tied to tradition in its method of planning, Chicago Circle responded innovatively to some of the new demands and circumstances. This response distinguished it as a significant experiment in the understanding of a large array of the problems involved in planning new universities.

The Chicago Circle master plan, similar to the traditional ones, consists of a series of individual buildings. Its concept of function as a unit organization, its urban density and organization of activities according to a hierarchy of frequent usage, however, are the innovations that challenged some of the complexities of the new demands.

Chicago Circle had an opening enrollment the size of a typical mature university. The high efficiency of space-usage achieved through grouping of activities by function, made it possible to double the enrollment two years after the opening and before the completion of all the facilities planned to accommodate that many students.

Chicago Circle's new scale and density is a bold departure from the past. It is an honest expression of the size of the new universities. It gives the total campus
a coherent organization.

Process

The search for an appropriate location for the new campus started as soon as 1954. From ninety sites, four were carefully analyzed, but none could be acquired. Mayor Richard Daley at this time offered urban renewal land that eventually became Chicago Circle. The site is one mile from the Chicago City Center and has an area of 104 acres. Under the provisions of urban renewal all but $4 million of the $27 million cost of this project was to be provided by the city and the federal government.

The university building program committee, headed by N. E. Parker who later became the university's vice president, issued the program for this project in 1960. The program proposed a new campus to accommodate for 6,000 students by 1963 and to provide for a peak growth of 20,000 students. The program required facilities for liberal arts, science, business administration, engineering, architecture, art, music, and physical education.

The master plan was presented in September of 1961, and the first student attended the new campus in 1964. The plan was to be constructed in three phases. The
architects' report on the university's construction stated:

"In the first phase of construction, there will be 13 buildings and the Great Court. These buildings are: Seven classrooms, a lecture center, the first unit of the library, the first unit of the Science and Engineering Laboratories Building, the Union Complex, the 28-story staff office and administration building, and the Physical Plant Unit." (1)

The second and third phases included: Additions to the library and the Science and Engineering Laboratories Buildings, four more classroom buildings, "a science and engineering staff office building and a laboratory building for architecture and art students." (2)

Concept

The major concept of the plan is the grouping of facilities by their functions rather than by their disciplines: Classrooms are clustered together, lecture halls were all housed under one roof, a structure housed all engineering and science labs, separate structures housed the student union and the one library. These are common facilities for all the departments of the university. Students of all disciplines come together in the use of
these spaces. The facilities are organized according to their hierarchy of use. The master plan could be described in terms of a series of concentric circles; spaces of most intense activity and greatest traffic are at the center while specialized spaces with less traffic are toward the outer rings.

Form

The main organizing elements of the campus are the lecture center with its rooftop plaza and the two-level circulation network. The lecture center is the nucleus of the entire composition. Here is the point of convergence of two levels of circulation and the gathering place of the largest number of students.

Parking for automobiles is located on the periphery of the campus. There are two pedestrian circulation networks; one on grade, the other one elevated. The elevated walk connects the buildings on the second level. Like an expressway, it links the north end of the campus to the center plaza, then moves toward the south, passes through a tunnel in the Engineering and Science Laboratories Building and continues to the south end of the campus. It is a spine around which most of the buildings are
CHICAGO CIRCLE 1961 PLAN

1. Lecture Center and Court  2. Student Union  3. Library  4. Elevated Walks
organized and connected to it through its branches.

The upper walks, twenty feet square slabs of granite supported by concrete columns are light in color, large in scale and straight. The ground level walks, on the other hand, are paved with brick, are darker in color, smoother in texture, and are laid in curved lines. These curved walks serve as emergency and service routes as well.

The lecture center contains 21 lecture theaters ranging in seating capacity from 75 to 500. Each of four 175-seat halls is arranged around a circular core where space is available for the installation of rare projection equipment. The plan of the round clusters of the lecture halls is projected on the plaza in the form of four "exedras," circular outside sitting places. The different plan of the lecture hall cluster containing the 500 seat hall is also recorded on the plaza by having an "extroverted exedra." In the center of the Great Court there is an amphitheater seating over 1,000. This amphitheater connecting the two levels functions as a great stairway.

Two of the most extensively used buildings on the campus wall the Great Court on two sides. The Student
Union from the east and the library from the west plug into the Court and create a large enclosure.

The Science and Engineering Laboratory is a four story structure located south of the Great Court. The first three floors of this building consist of fifty feet square labs backed up by common preparation rooms. The top floor of the building housing technological research is a column free space. It is sheltered by a steel framed roof spanning 75' by 112' bays.

To the east and west of the two level walkway and linked to it are eleven classroom buildings. Nine of these two-story structures are grouped in clusters of three. Classroom buildings are glazed with very dark glass to allow projection without the use of any shades.

A 28-story office building on the north end of the campus houses all of the staff and administration offices. Direct access to the second level from the outside is permitted by a branch of the two level walkway on the east side and by a circular ramp on the other side.

Analysis

Chicago Circle was planned for an initial enrollment of 6,000, growth to 12,000 in the second phase, and
finally 20,000 for the third and final phase. From this number only 300-400 were to be graduate students.

As it turned out, the initial enrollment was 9,000 and by 1966, two years after the opening of the school, the enrollment reached its limit of 20,000. The university, however, did not stop growing. The enrollment estimate for 1970 required accommodations for 24,000 students. (3) Furthermore, the need for graduate studies increased 15 times more than the initial estimate.

Only four years after the opening of the university, its scale and scope changed, and its plan began to fail to meet the new demands; the separation of functions by placing them in different buildings is not compatible with the needs of research and the work pattern of graduate students. Vice president Parker stated that "The break with the basic planning concept of single-function buildings is likely to be permanent." The main reason for the break is the change in the university's mission. Parker said: "We originally assumed that this would be an undergraduate institution with a relatively small amount of research. Now it is becoming a comprehensive university. Graduate study and research require a more cohesive arrangement of offices, teaching spaces and library
1965 PLAN

A. Gym  B. Science and Engineering Research Center  
C. Behavioral Science Center  E. Education Building
facilities." (4)

This change in scale and scope of the university created new problems before the completion of the original plan. After the completion of phase I in 1965 and during the construction of phases II and III, a new plan and concept had to be devised to accommodate the new demands. With the new emphasis on graduate studies the concept of isolating functions in separate buildings had to be reconsidered. The new plan called for creation of new structures similar in concept to the departmental buildings common to traditional campuses. They house laboratories as well as lecture rooms, faculty and staff offices. Due to the long distances from the central facilities, these subcenters contained their own food service facilities. The new facilities were located outside the original composition. The Behavioral Science Center was located on the northwest edge of the campus while Science and Engineering Center was located on the south end. The Education Building is planned to be located north of the Behavioral Science Center. The units, although containing all of their own departmental spaces, are not independent from the rest of the campus. To reach even the central facilities of the old plan, very
long distances have to be traveled on foot. This is an especially difficult task on windy cold winter days of Chicago. The walkway system along with the Great Court, very strong elements in the design and planned to be highly used, are deserted most of the fall and winter.

Most of the circulation problems as well as the plan's lack of adaptability can be identified with the physical separation of activities. Since Chicago Circle was financed as an urban renewal project, unlike the traditional campuses, it did not have to plan separate buildings to commemorate different donors who financed buildings incrementally. Rather than utilizing this potential to create a continuous learning space, to provide a flexible system adaptable to new circumstances, as well as to better provide for informal learning and student interaction integrated within an appropriate circulation system, planning was carried out as a series of isolated buildings.
Scarborough College
SCARBOROUGH COLLEGE

In the development stages of campus planning concept and in achieving a more appropriate solution, Scarborough College is developed a step beyond Chicago Circle. Most of the circulation problems as well as the problems of physical relationships between different activities, as experienced in the Chicago Circle Campus seem to be solved in this project. Scarborough, on the other hand, is designed tightly around a very specific academic program and is not adaptable to any other program different in method or technology.

Scarborough College responded to the local climate by providing an interior circulation system which has created not only a coherent circulation pattern, but also spaces for students' informal interaction and learning.

The plan although consists of three distinct zones, unlike Chicago Circle does not isolate all of the activities in separate structures. Labs, seminar-rooms and faculty offices are adjacent to each other. Furthermore, different zones are linked together by the interior circulation system.
Process

Scarborough College is a part of the University of Toronto expansion program. It was planned to "relegate the mother campus to providing only graduate studies to the many undergraduate campuses all over the metropolitan region." (5)

The academic program was presented to a team of architects and planners, assembled by the University of Toronto Planning Board. The academic program required a campus to accommodate for 5,000 students at its final stage of growth. Furthermore, it required accommodations for a teaching method using the new educational technology. "The College believes no single teacher can encompass thoroughly and creatively a single discipline. Secondly, there aren't enough super-teachers to serve the ever-expanding enrollment. Accordingly, Scarborough has eliminated the Mark Hopkins approach to learning and has turned to the new educational technology." (6)

"The College's educational philosophy is expressed by its belief that all students should be exposed to the best intellectual minds available in the subject field offered; and at the same time all students should be given maximum opportunity through small discussion groups, to
pursue personal interaction and response to the facts and values revealed in the exposition." (7)

The site for the campus was selected by the University of Toronto Planning Board before the selection of the architects and planners. It is located in Toronto's suburb, twenty miles from the city center. The site, a 200 acre plot is zoned such that only 50 acres of it could be built upon.

Concept

Scarborough's main concept is the creation of a single structure housing most of the educational facilities. The purpose is to create close proximity for related facilities and provide more opportunity for informal interaction between the students and faculty. The main organizing element of the plan is an interior circulation system forming a spine for the whole campus.

Facilities on both sides of this spine accommodate for the teaching method required in the academic program. There are television studies, large lecture theaters and small seminar rooms. The information is exchanged through closed-circuit television to large groups of students in the lecture halls. That is where exposure to
the great minds occurs. Students then divide into small groups in the seminar rooms to discuss their responses to the lectures. The seminars are led by junior instructors.

Form

The plan, to be constructed in two phases consists of a large linear structure. Following the topography of the site, it houses all the educational facilities of the first phase. In the second phase, the line will grow longer on both sides, and additional facilities will be constructed on the north plateau.

The focal element of the plan is the Meeting Place, an 80' square space four stories high. This sky-lighted space is surrounded on different levels by central facilities such as the cafeteria and kitchen, faculty dining room, library (in the first phase), book store, and administrative offices. From the Meeting Place, the Science Wing extends westward and the Humanities Wing extends eastward.

The Science Wing houses laboratories as well as faculty labs, offices and lecture halls. Student labs are located on the south side of the building. Every set
of two labs share a common preparation room. These rooms
and labs are serviced by service towers which move parallel
to the exterior wall of the building. Each lab
accommodates 20 students. Its size, "was limited by the
preferred distance from a television screen. Each lab
is plugged into a closed circuit television teaching
system." (8) The faculty labs and offices are lined up
across from the student labs. The lecture halls occur at
the points, where the building adjusts to the topography
and changes direction. The studios for closed circuit
television are located at the end of the science labs.
Access to the Science Wing is from the plateau level to
the north. There are several entrances at this level.
These entrances lead into an interior street which forms
a spine stringing laboratories together. Access to the
upper and lower level labs is through staircases located
along the interior street.

The circulation spine leads to the Meeting Place and
descends one story to reach it. Then it moves eastward
to form the spine of the Humanities Wing. In this sec-
tion, there are two levels of lecture halls to the east
and three levels of offices to the west of the pedestrian
street which is several stories high and sky-lighted.
Each level of offices has a continuous balcony for its circulation. The lecture halls on the street level have a seating capacity for 200, while the upper lecture halls each seat 100. Three large auditoriums, each seating 250, are located at the turning point of the building's change of direction. The Humanities Wing can be entered from both the plateau to the north and the valley to the south.

Analysis

Scarborough is a building with an integrated system. It becomes obsolete once its system becomes obsolete. Scarborough is a tight-fit design around a particular academic program using a specific kind of educational technology. The size of the laboratories is determined by the vision radius of a certain size television screen. The size of these labs are furthermore fixed by the massive concrete towers on two sides and the limits of the linear building on the other sides. What will happen when economics dictates the installation of a larger screen to teach a much larger audience? How are these labs going to expand? What will happen when this method of teaching becomes obsolete? We have already observed
how the scale of the classrooms as well as laboratories have changed in response to technological advancements, the task of teaching a large number of students with fewer teachers, and, finally, economic pressures.

Scarborough is not adaptable to any changes in educational program different in method or technology from its present design, nor can it accommodate any change in the size of the institution.

It is worthy of note that nearly 300 years ago, a college building was constructed with a similar concept. A building housing all of the educational facilities, the Old College at Harvard, could be compared with this new structure.

The Old College was much smaller in scale and more modest in appearance than Scarborough. However, it had the additional feature of housing accommodations for both the student body and faculty. The Old College was not designed around any mechanical services and its interior spaces were quite flexible. The spaces in Scarborough, on the other hand, are formed either by service towers or by the operation of certain technological processes with no built-in adaptation to any other system. The Old College was constructed with relatively short-lasting
materials and the building deteriorated before it could become obsolete. Scarborough, however, is constructed with strong reinforced concrete that will last for centuries. In addition, it is tightly designed around a form of technology that is susceptible to obsolescence in a shorter period of time than the Old College lived.

Scarborough is designed with the final growth target of 5,000. Considering the similar cases in the past, growth limits based on present demands are not realistic. Richard Dober in his report on Scarborough College states:

"Though committed to a long-range target (5,000 students) beyond which growth is not anticipated, I sensed in a discussion with various people in Scarborough that it may well be that it could grow beyond that number especially if there is a scarcity of funds for the necessary development of additional satellite campuses for the University of Toronto. That is to say, the incremental cost of starting a new enterprise may be significantly greater than continuing Scarborough beyond 5,000 students, and public finance may eventually dictate size." (9)

The interdependency of the different elements on both ends of the linear design limits the campus' growth. With this plan's organization, the limit is further reinforced.
by the dependency on the central focal point. Considering the walking distances, the second phase addition seems to be the growth limit for this structure.
Berlin Free University
BERLIN FREE UNIVERSITY

Berlin Free University is a further development in campus planning concepts. Its organizational pattern is a complete departure from the traditional campuses.

Unlike Chicago Circle, it is not a composition of isolated buildings nor is it a building with the limited growth potential of Scarborough. It is a system of organization maximizing human association and oriented toward growth and change. It is an open ended system that could be realized in many stages. Each stage independent of future increments is a valid statement.

Process

Berlin Free University is the expansion of the western sector of Humboldt University in Berlin. The plan was the subject of a worldwide competition. The winning project was the solution submitted by Candilis, Josic, and Woods.

The site is 24 acres, located 6 miles from the city center. This scheme accommodates for 3,300 students in the first phase of construction and is supposed to have adaptation for unlimited growth.
Concept

The concept revolves around two major issues; human association and growth. The principal function of a university as expressed by architect Shadrach Woods "is to encourage exchange between people in different disciplines with a view to enlarging the field of human knowledge. Our intention then, in this scheme, is to provide within one organization, maximum possibilities for contact and interchange in the community university whilst ensuring privacy for each function." (10) A grid is used as an organizing device. This grid relates all of the disciplines together. Based on the belief that "in skyscraper type buildings disciplines tend to be segregated" (11) on different floors; the structures within the grid are not higher than two stories. The grid, furthermore, allows for a polycentric development which ensures the possibility for continuous growth.

Form

The principal organizational elements of the plan are four parallel pedestrian walkways running northeast to southwest with a distance of 200' or one minute walking distance apart. These walkways are 16' wide and are
interconnected at different intervals with secondary 8' wide walkways. Places of common and frequent usage such as auditoriums, libraries, lecture halls, exhibit spaces, and lounges are placed around the major stems, while specialized facilities and spaces with less traffic are located away from the major roads. They are approached through the secondary circulation system.

The campus has three levels in section: The underground level provides spaces for services and storage; the ground level contains most of the academic facilities; the upper level houses offices and small classrooms. The possibility of a fourth level accommodating student housing has been studied. Parking for automobiles is not provided on campus. Two auto-ports are designed on the periphery of the first stage grid.

Analysis

Although the concept of organization of the plan is based on growth and association between students of different disciplines, Berlin Free University is a departmentally organized campus. The facilities of each department are designed with specific balance and scale required for that particular department. Changes are not
only likely to occur within the walls of a particular department, but they can also affect the operation and organization of the whole university. It is only realistic to assume the possibility of the replacement of the departmental system by another form of academic organization. The increasing enrollment and search for efficiency might dictate this change.

This plan with its present scale might be able to accommodate this change. But if the university continues to expand according to the present organization, it will soon reach a limit which could not possibly adapt to any changes in academic organization. Similar to Scarborough, this campus has its Humanities departments on one end of the campus and its Science laboratories on the other end. As these facilities will grow in opposite directions, the accessibility of each will become more difficult.

One of the reasons for having a single location for all university facilities and activities is the contribution of different activities to each other. As a result, activities of a university in different degrees are dependent on each other. This dependency necessitates proximity and ease of access between all the activities. The present scale of Berlin Free University fulfills such
Breakdown by Departments

Open spaces

Pedestrian Network
requirements; however, if it expands much beyond its present size - with the same height limitation - it will cover such a vast surface of ground that dissociation would be caused between distant activities. The concept of "ground scraper" rather than skyscrapers to ensure association between disciplines does not sound very reasonable. This association can more effectively be achieved through academic planning and close proximity of different facilities. The problem of proximity can be solved by allowing vertical growth as well as horizontal growth and by allocating the lowest level to vehicular traffic with the possibility of adding a transit system whenever the need arises.
FOOTNOTES


2. Ibid., P. 5.


ILLUSTRATIONS

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CONCLUSION

Through the limitation of funds and institutional scope, colonial colleges in the United States mostly originated with a single building sited on an open landscape. With no significant planning, additional buildings were constructed whenever need would arise and funds were available.

Most Post-Revolution campuses, on the other hand, were founded with a predetermined plan. The plan consisted of a composition of individual buildings, forming courts, quadrangles, vistas and other architectural compositions of the time.

Since individual donors contributed toward the construction of each building, usually one at a time, this concept of planning was comparable with the method of financing of future expansions of the campus. This method of planning, however, was a response to the existing demands and the institutional scope as well as a projection for the future based on present circumstances.

Usually, as circumstances changed the master plan became detrimental to the accommodation of new demands. The completed quadrangle and symmetrical composition did not lend itself to further expansions. Furthermore the
eclectic form of the buildings were not compatible with the program of the new functions they were to house.

The circumstances for new campuses were quite different from those under which older campuses were planned. Increasing affluence, scientific and technological advancements, urbanization and specialization along with the international scientific race influenced the methods and scope of higher education as well as the physical form of the institutions of higher education, their relative sizes and the processes of their establishment.

Universities became more involved in scientific research and graduate studies expanded drastically. Technological innovations changed the methods of teaching and the increase in enrollment accelerated at a much higher rate than had been estimated. Provision for future growth became a crucial issue and funds were made available to construct significantly large amounts of facilities at one time.

In planning the new universities, a lesson could have been learned from past experiences. The assumptions of future circumstances and their effect on the form and the relative size of the institution according to the conditions and demands of the present time was not realistic.
As time passed by, the old master plan became more and more detrimental to the accommodation of new demands. New plans, which in turn became inappropriate, in a few years were juxtaposed against the old ones. This process created a chaotic condition of traffic, services and relationship of elements in a historic museum of architectural styles.

The new campuses, although introducing innovations to challenge some of the complexities of new demands, were tied, however, to traditional methods of planning. Rather than providing an organizing device which accommodated for today's demand as well as adjustments for unperceived future circumstances, they were concerned with the design of buildings.

Some new campuses, such as Chicago Circle, are composed of individual structures isolating either function or discipline. Others, similar to Scarborough, house all the educational facilities in one single building. The latter, a building with an integrated system built at a time to house all educational facilities is similar to the concept of colonial colleges, except the services of the new buildings are mechanical and are susceptible to a faster rate of obsolescence. A building with an integrated
system becomes obsolete once its system becomes obsolete.

The concept of grid as organizing devices for Berlin Free University campus was a departure from the traditional concepts of campus planning. Its zoning of science and humanities and its departmental organization, however, will not allow for changes in academic planning. Its height limitation and zoning of vehicular traffic will limit its growth.

Based on the findings of this study, a concept of planning must be based on an open ended infrastructure as an organizing device. In order to insure unrestricted growth and adaptability of the university to the unperceived future circumstances, this infrastructure should allow for polycentric development, proximity of activities and technological change.
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