ARY
Montana State University
BOZEMAN

an office classroom building

FOR
MONTANA STATE UNIVERSITY

AN OFFICE - CLASSROOM BUILDING
for
MONTANA STATE UNIVERSITY

Part I

Undergraduate Thesis in Architectural Design

By

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A college is people, ideas, and a place - and in that order. A college aspiring to completeness in all things will somehow find a way to cast up a physical environment that supports and sustains its mission.

Harold B. Gores
President, Educational Facilities Laboratories, Inc.

(15 , 1964, intro.)

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INTRODUCTION

An office - classroom building is needed at Montana State University by 1972. This paper is the analysis for the design of the facility. I have studied the basic needs of the building as based on learning processes, perception, and student load requirements. The result is not a list of rooms with square foot areas but a list of activities and a study of conditions affecting these activities.

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education

Eric Ashley said of the contemporary university: ..."the university is an institution with urgent and essential obligations to modern society; a place to which society entrusts its most intelligent young people and from which it expects to receive its most highly trained citizens; a place which society regards as the pace-maker for scientific research and technical progress." (11, 1966, p. 41.) And more broadly, the university is a reflection of society. This institution is structured around: 1. a group of teachers; 2. a systematic process directed at learning.

Within this structure, new needs have formed and changes to meet these needs have been taking place. As the President of the University of the State of New York, James E. Allen, Jr. said it, "Never before in history have our schools engaged in such widespread experimentation to meet the new educational requirements." (12, 1960, p. 6.) But, there are several probelms developing.

One large probelm is the supply of teachers is not growing as fast as the supply of students, which means that teachers will have greater numbers of students to instruct. This means that teachers will have greater numbers of students or new teaching methods will have to be used, or both. Research is on such an upward swing that it is also cutting into faculty teaching loads. In 1940, only $1 out of every $25 spent on higher education went to research. By 1960, this ratio had increased to $1 out of every $5, and by 1970, it is expected to reach $1 out of every $3. (2, 1963, p. 10.)

With a force of more than 7,000,000 degree-credit students expected by 1970, a tremendous building program is going to be required. Economist Peter F. Drucker projected in 1963 that by 1972 $19 billion would have to be spent nationally on this construction. (2, 1963, p. 7.) Unfortunately, there is a large gap between needs and actual construction. Most of this gap is caused by inadequate facilities not being replaced. In 1959, it was estimated that one-fifth of the college students went to class in substandard or obsolete buildings and this figure has undoubtedly increased as the gap between construction needs and actual construction has widened. (7, 1959, p. 11.) Despite these figures, experts agree that the interested student will still continue to find

room on the campus, but unless more careful planning is done by the educators and a greater financial commitment given by society, facilities will unfortunately be built in necessarily "crash programs." "Expediency rather than quality will be the byword. And, our campuses will be crowded with misplaced academic slums, educationally self-defeating and a drain both educationally and economically on future generations." (2, 1963, p. 16.) The probelm is clear. The university needs a larger source of income to spend on better planned courses of action.

The colleges of today are in transition and must look deeply into the future in order to meet the changing needs and demands of society and technology. Clark Kerr stated that universities currently face four areas of related adjustment: 1. growth; 2. shifting academic emphasis; 3. involvement in the life of society; 4. response to the new federal involvement. (11, 1966, p. 20.) The growth is obvious and also apparent is the shifting of academic emphasis and greater involvement in society: Within this country, there has been a real blossoming of the creative arts; there is a great increase in need for scientists, engineers and physicians; other areas such as business administration and social work are becoming more formally professional. More and more industry is reaching into the university and vice-versa, and there is an increased emphasis in continuing education. Some campuses are even taking the place of downtown areas of communities as the cultural center of the community as these areas decay. This change must be met in several ways. Institutions must establish a broader range on contact between student and teacher than the"one way route across the lectern." (11, 1966, p. 36.) Greater contact needs to be made between the people doing the research and the people doing the teaching. Architecturally, this means that common spaces promoting interaction must be provided.

The physical nature of the campus must also change to meet the needs. There is a greater trend in new campus-development toward a free-flowing space designed to serve the individual than to the buildings like the single, rigid monuments of the past. The overall layout of the campus is evolving toward a plan whose parts are all easily accessible by the student and faculty member on foot. (The only notable exception to this trend is the California schools where single universities are broken up into several campuses.) Also desired for the

contemporary university is a middle ground between classrooms and pure fun where "students and faculty can meet and discuss academic matters informally." (13, 1961, p. 25.) This means that discussion areas must be provided that possess none of the formality of the classroom and that can be easily used by faculty and students. New classroom buildings, in particular, "must accommodate and encourage independent study as students are thrown more and more on their own." (2, 1963, p.30.) It is possible that much of the factual information will be learned with the use of machines, freeing the teacher to aid the student in learning thought processes.

In general, the universities of today must look deeply into the future to provide for a tremendous increase in students, changes in academic emphasis, and changes in teaching methods.

M.S.U.

Orginally established in 1893 as the Agricultural College of the State of Montana at Bozeman, Montana under the Morrill Act, the State University is one of the six institutions of higher learning in the Montana university system. From the orginial enrollment of 46 students, the University has grown to over 7,000 students enrolled in the fall quarter of 1968. Montana State University has expanded its originial agriculture emphasis to include five colleges: Agriculture, Education, Engineering, Letters and Science, and Professional Schools. At the present time, the school engages in a wide variety of research such as: electronics, grain production and nuclear physics.

From the time of the formation of the school, there has been a concern for the total person, not just the academic emphasis. "Throughout the school's history, relationships between students and faculty have been close. Extracurricular organizations and activities have always been considered of high educational value. Student and faculty organizations began to form immediatley..." (3, 1968, p. 36.) In addition to scholastic and service organizations, there is an active Greek community on the campus.

In recent years, the University has obtained a large number of guest lecturers and cultural programs including many top professional people from the entertainment world. This has not only become part of the University scene but a source of entertainment for Bozeman and southwestern Montana.

Montana State University has a semi-rural character in that it is in a small community, at the foot of several mountain ranges, and is near no large communities. These factors create an environment on campus similar to that of a small community: the students all live in close proximity and work on a relatively small campus allowing a large percentage of people to become at least visual acquaintances: many of the students share outside interests such as skiing and thereby further relationships with members of the campus community: also, the mountain setting helps to give the University a relaxed atmosphere by providing a totally rural environment at both a close distance and short-time range from the campus.

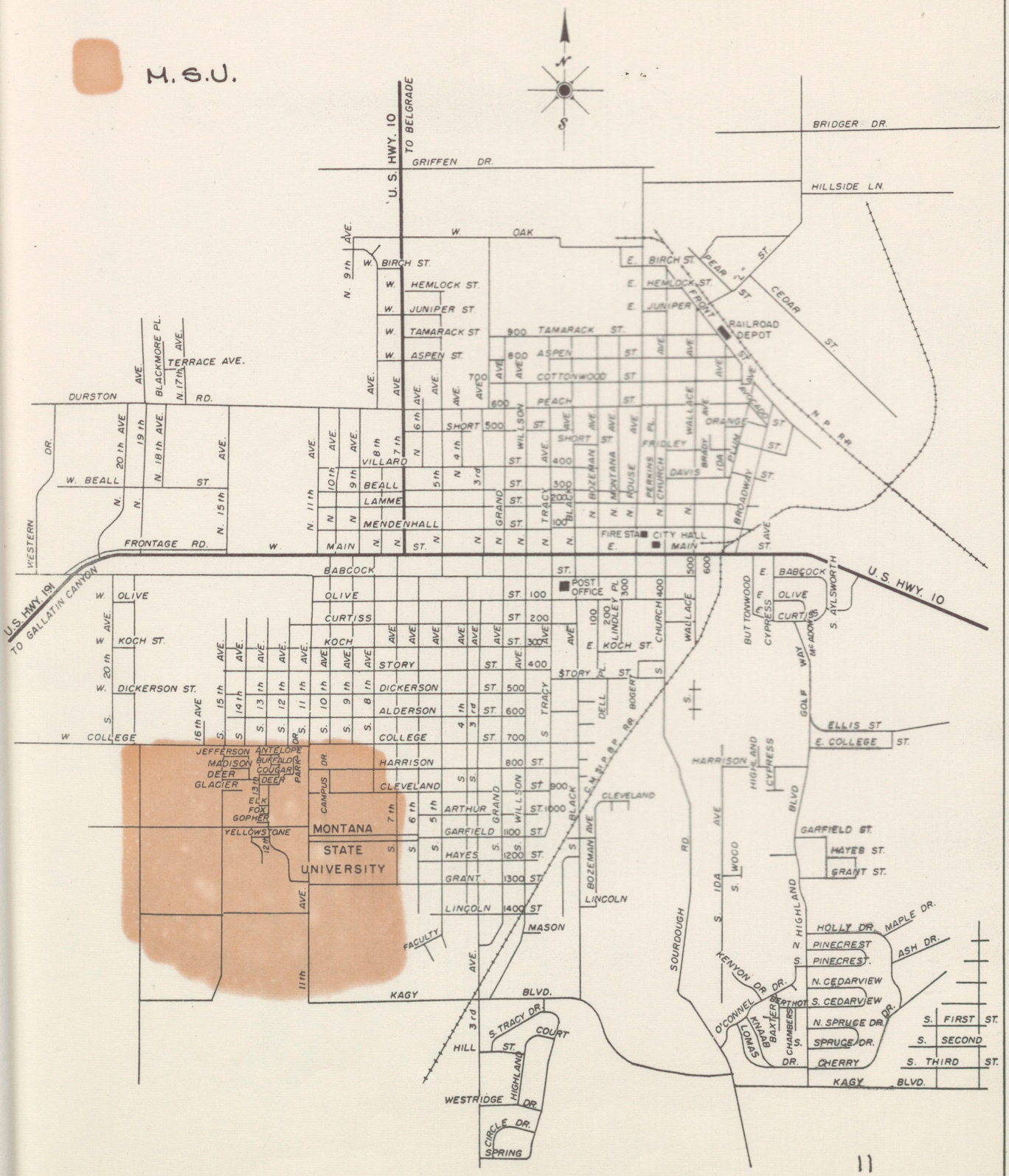
The center of non-academic activity on the campus is the Student Union Building. Here the students can meet and talk informally with

each other as well as with members of the faculty. Providing for this interaction is, in my opinion, the most rewarding function of the building. During the warmer months, outdoor areas also serve this purpose. (The lawn around the pond off South 11th Street is very popular.)

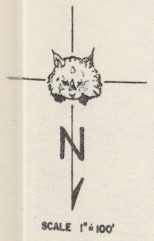
The major tradition of the University began in the autumn of 1915 by the Class of 1918 when they started construction of the 240 foot "M" On May 8, 1916, the class finished the project with the stated purpose; "To leave an enduring monument for the class, and to stimulate future classes." (3, 1968, pp. 116-118.)

Although traditionally conservative, the University is constantly growing into new areas of endeavor. Old ideas are being cast aside for the new and each year changes are made in an attempt to make Montana State University a better place for learning.

MAP OF BOZEMAN MONTANA



MONTANA
ATE UNIVERSITY
CAMPUS MAP



Revised August 1962

Revised Jan 1964

Revised Sept 1967

RESEARCH LAB
FACULTY COURT
GROUNDS BLDG.
SOUTH FIFTH AVENUE
SERVICE SHOPS
LAUNDRY
HEATING PLANT
LINCOLN ROAD
TENNIS COURTS
H. & P.E. CENTER
GATTON FIELD
PARKING
GRANT STREET
RYON LAB
CHEM. ENG. LAB
ROBERTS HALL
GYMNASIUM
NEW CHEMISTRY
MATH-PHYSICS
MUSIC
STUDENT UNION
LIBRARY ADDITION
REID HALL
CHEMISTRY
ANNEX
BRIDGER HALL
GARFIELD STREET
GARAGE
HAMILTON HALL
ANNEX
MONT HALL
BOTANY GREENHOUSE
FISH & GAME
LEWIS HALL
MEDICAL SCIENCE RESEARCH
CHAPEL
EXT. BLDG.
GRAIN LAB
HANNON HALL
BOBCAT CAGE
HERRICK HALL
A. I. BLDG.
AGR. BLDG.
CLEVELAND STREET
SIXTH AVENUE
SEVENTH AVENUE
EIGHTH AVENUE
QUADRANGLE
HAPNER HALL
HARRISON STREET
LEWIS & CLARK HALL
LANGFORD HALL
SOUTH BARRACKS
NORTH BARRACKS
AGR. ENG. SHOP
WOOL LAB
MILITARY SCIENCE
COLLEGE STREET
CHEM. RESEARCH
USDA
MUSEUM
GRANARY
STOCK PAV.
AGRICULTURAL GREENHOUSE
ROSKIE "C"
pond
HEDGES SOUTH
FOOD SERVICE BUILDING
HEDGES NORTH
HOG BARN
CATTLE SHED
BEEF BARN
GOPHER STREET
AGRONOMY FIELD HOUSE
FOX STREET
ELK STREET
GLACIER COURT
DEER STREET
COUGAR STREET
BUFFALO STREET
ANTELOPE STREET
MADISON COURT
JEFFERSON COURT
SOUTH ELEVENTH AVENUE
SOUTH TWELFTH AVENUE
SOUTH THIRTEENTH AVENUE
SOUTH FIFTEENTH AVENUE
CUSTER PLACE
PARK DRIVE
HUFFINE LANE
CARETAKER
VET. RESEARCH-DIAGNOSTIC LAB
BEEF NUTRITION CENTER &
AG FIELD BUILDINGS
DAIRY CENTER 3/4 MILE

conditions creating a need

The probelms at Montana State University can be discussed in more specific terms and the needs for a new classroom-office building shown by glaring facts.

The enrollment at Montana State University is expected to increase from 6,768 in 1967 to 9,800 by 1979 which is an increase over present needs of almost 50%. In order to be feasible, present designing for the campus must allow for this increase. Displacement of and enlarging enrollment in the departments scheduled to house the new building will require 30,000 sq. ft. of assignable classroom area not presently available. The exisiting instructional and research staff will increase from 80 to 130 and the number of graduate assistants is expected to increase from 20 to 47 by 1979. The following is an excerpt from Space for the Seventies, a report prepared for the 1969 State Legislature by W.A. Johnstone and A.A. van Teylingen:

> One of the most urgent needs on the campus is the improvement of classroom environment. Many of our classrooms are now in World War I wooden barracks, frame structures purchased from an abandoned chromium mine and structures dating as far back as before the turn of the century.
>
> Of our total exisiting classroom area, one-third of it is substandard by any criteria, one-third of it is marginal and needs improvement. Only the remaining one-third provided the proper environment for adequate instruction.
>
> Another urgent need is adequate office space for staff. Many are housed in areas which can be best described as cubbyholes. This detracts from their effectiveness as teachers which is a prime function. As an example, "How do you counsel a student when three others can't help but listen in?"
>
> These conditions will be greatly alleviated by the provision of these proposed facilities. It will house in addition to the students in classrooms, those staff members of Mathematics, (now temporarily in the Library), Sociology, (now in the old frame building), English, (now in a remodeled dorm which will better house administration), and History, Government and Philosophy, (which will be dislodged from Reid Hall by other departments now located there which will expand.

This displacement of faculty and students will become necessary as:

1. History, Government, and Philosophy are moved out of Reid Hall by

the growing demands of Commerce, Education, Modern Languages, independent departments, and administration.

2. Some members of the Mathematics department leave the 2nd floor of the library.

3. Sociology is moved out of the Montana Hall Annex which will be torn down.

4. English and Speech will loose their office space in Hamilton Hall to the expansion of other facilities.

As previously stated, the spaces that presently exist are in many instances inadequate. Teachers are forced to double up in offices, shelving is often inadequate and storage space is minimal. Classroom space is not flexible. Sound transmission is a great probelm in the rooms in Montana Hall where sound comes in from above, below, and from the hallways in very disruptive quantities. The building is also a fire hazard. Another exisiting probelm is the neccessity to be continually crossing the campus on icy sidewalks in below freezing weather, (an average of 187 days per year reach below 32 degrees.) This contributes not only to the great discomfort and inconvenience of the student and faculty but to the maintenance load on the custodians in the form of tracked in mud, ice, and snow.

It is obvious that additional space is needed to provide for the expected increase of about 3,000 students over the next 10 years but consideration must also be given to provide facilities that are more than an addition to exisiting facilities. The new facilities must provide an improved educational environment that is more efficient, more flexible, and more suited to the future educational needs of the university than is presently available on the campus.

M.S.U. ENROLLMENT STUDIES

	1967	1975	1979
LOWER DIVISION	63%	60%	55%
UPPER DIVISION	33%	32%	33%
GRADUATE	4%	8%	12%
NOV I NET			
LOWER DIVISION	4264	5068	5390
UPPER DIVISION	2233	2714	3234
GRADUATE	271	678	1174
TOTAL	**6768**	**8480**	**9800**
GROWTH FACTOR			
LOWER DIVISION		1.193	1.264
UPPER DIVISION-GRADUATE		1.355	1.761

FTE OF DEPARTMENTS USING THE BUILDING

DEPARTMENT	LOWER DIVISION			UPPER DIV. & GRAD.		
	1967	1973	1979	1967	1973	1975
MATHEMATICS	611	729	722	114	154	201
HISTORY, GOVERNMENT, & PHILOSOPHY	378	451	478	111	150	195
SOCIOLOGY	105	125	133	91	123	160
ENGLISH, SPEECH, & THEATRE ARTS	468	558	592	105	146	190

STAFF OF DEPARTMENTS USING THE BUILDING

DEPARTMENT	INSTRUCTIONAL STAFF			GRAD. ASSISTANTS		
	1967	1973	1979	1967	1973	1979
MATHEMATICS	30	39	44	13	17	20
HISTORY, GOVERNMENT, & PHILOSOPHY	14.2	20	25	2	5	10
SOCIOLOGY	6.1	8	11	3	5	7
ENGLISH, SPEECH, & THEATRE ARTS	27.8	35	39	2	5	10

PROJECTED SPACE NEEDS FOR 1979

IN 1,000'S OF ASSIGNABLE SQ. FT.

CLASSROOMS	30.0
MATHEMATICS	12.0
HIST., GOVERNMENT & PHIL.	5.7
SOCIOLOGY	5.8
ENGLISH, SPEECH	6.2
LIBRARY	2.5
TOTAL	62.2

FROM SPACE FOR THE SEVENTIES

function

PERCEPTION

The spaces an architect designs are nothing but meaningless shapes with names if the designer has no knowledge of what these spaces do to people in terms of reaction to the experiencing of these spaces. Knowledge of experience-reaction to a space is especially important if the space's function is to enclose a place for the performance of a task. The designerof a classroom is naturally more concerned with efficiency based on man's perception of the variables of environment and the effect of these variables on his performance of particular tasks.

"If we conceive of the environment as composed of many variables each showing some uncertainty, then the environment has a vast amount of potential information.....This condition means that the environment also has great potential structure." (5, 1965, pp. 41.) This structure is shown to the designer through the constraints created by the environmental variables. The following is a condensation of information about these variables taken from SER 2: Environmental Evaluations published by the University of Michagan's Architectural Research Laboratory in 1965. As stated in an introduction, SER 2 is "an attempt to summarize and evaluate the present state of knowledge concerning the various aspects of environment that affect human behavior in general and learning in particular."

The ultimate result of architectural design is defined space. The experience of these spaces involves interaction of senses providing the individual with a variety of emotional responses: delight, chill, excitment, etc. The great majority of our perceptual information is received through our eyes and ears.

SIGHT

1. perception: The eye's ability to detect an object is 10 times stronger than its ability to distinguish form. Acuity is affected by the direction of an object from line-of-sight, e.g. forms appear to get smaller as they approach the periphery of the field of vision and acuity drops. Under daylight conditions, maximum acuity occurs when tasks are 0 degrees from the fovea, i.e., direct line-of-sight. As the task reaches 15 degrees out toward the periphery, acuity drops to only 15% of maximum. Under low illumination acuity drops to 10% when a task is only 4

degrees from the fovea. Motion also affects acuity. With a task moving at 50 degrees/sec., acuity drops to 60% of maximum with a stationary task.

2. contrast: The best acuity is acheived when the background is darker than the task and the value contrast is between 1:1 and 4:1. Acuity drops 10% with a 250:1 contrast ratio and drops 20% if the background is completely advoided. Glare is introduced and a ratio of only 1:20 results in a 20% loss of acuity.

3. color: White lighting provided better acuity and range of color judgements than chromatic lighting. If it is necessary to use monochromatic lighting, yellow is best; blue, green, and red should be advoided. International orange is the most easily detected color as a separate entity. Colors also create spacial feelings, eg. warm colors advance and cool colors recede.

HEARING

Although our quickest reaction is to the sensation of touch (.15 sec.), we react faster to sound than light (.19 sec. as compared with .22 sec.). The most information in the sound of speech is given us through the distoration of frequency, amplitude, and time. One of the greatest probelms with sound control is noise level. Continuous noise seems to have very little effect on performance while a sharp sound or cessation of exisiting sound is a disruptive influence. Low frequency noise is most effective for making speech. When making speech, it is more important that the noise have similar physical characteristics than the same intensity of the speech. If the noise level is kept below 90bd, no effects are observed on task performance. A final thought is that people vary in their ability to handle noise and it is therefore advisable in some circumstances to subgroup students in order of acoustical preference.

A great factor in our environment is the effect on us by other individuals. "It is man's most important feature that he can internalize or learn to accept as his own, another individual's sanctions, attitudes, beliefs, and values." (4, 1965, p. 19.) Our spatial relationships in groups of people also affect our actions. (See normal talking distances on the following page.) These spatial factors include size of group, spacial arrangement, and separation of members. Different types of tasks require different types and sizes of groups and different environmental conditions for optimum efficiency in solving the task.

As an example, people sitting opposite each other interact much more than persons sitting side by side. A person's behavior in a group is also affected by psychological distance from norms under which he acts.

I believe that designing an environment is meaningless without consideration being given to its perception. These information bits are admittedly very brief, but they help create a basis for formulating the following design criteria.

OFFICE SPACE

The office space is a major part of the building. Offices have a definite affect on the teachers and their role in the university. Office conditions can seriously effect morale, productivity, and satisfaction with position. As the university scene changes, the faculty member is finding himself spending more and more time with colleagues, committees, and students. The result is more time in the office which makes more vital the importance of sufficient, good-quality office space. When adequate office space is not provided when a complex is built, it often becomes necessary to convert classroom space to office space. This conversion usually results in inefficient use of space. It is therefore vital to provide adequate space during the beginning stages of planning.

The space itself must provide: an informal atmosphere conducive to conducting discussion and counseling; a comfortable, well-lighted area for reading and writing; and an environment the average faculty member is going to enjoy being in since he will spend an average of twenty-eight hours per week there. (6, 1961, p. 13.) Some qualities a group of faculty members desired for their offices included: mobility and flexibility, privacy, an attractive working environment, plenty of book shelves, and good facilities for student-teacher conferences. (6, 1961, p. 15.) See the following page for a breakdown of activities within the office.

OFFICE SPACE FUNCTION ANALYSIS

FACULTY ACTIVITIES	SPACE NEEDS: PORTION OF TOTAL TIME *	VISUAL PRIVACY: PRIVATE	VISUAL PRIVACY: RELATIVE PRIVACY	VISUAL PRIVACY: SEMI-PUBLIC	VISUAL PRIVACY:	ACOUSTICS: REQUIRES QUIET	ACOUSTICS: REQUIRES RELATIVE QUIET	ACOUSTICS: AVERAGE SOUND LEVEL	ACOUSTICS: NOISY	ACOUSTICS:	LIGHTING: NATURAL LIGHT DESIRED	LIGHTING: HIGH LEVEL ILLUM.	LIGHTING: MED.-LOW LEVEL ILLUM.	LIGHTING:	EQUIPMENT: NEEDS WRITING SURFACE	EQUIPMENT: DESK CHAIR	EQUIPMENT: SIDE ARM CHAIR	EQUIPMENT: SHELVES	EQUIPMENT: EQUIP. STORAGE	EQUIPMENT: TABLE	EQUIPMENT:
COUNSELING STUDENTS	19	●						●			●		●		●	○				●	
CONFERENCES WITH COLLEAGUES	16			●				●			●		●							●	
GENERAL WRITING	13	○	●					●				●			●	●		●	●		
PREPARATION OF INSTRUCTION	13		●					●			●	●			●	●		●	●	●	
RESEARCH	13		●			●					●	●			●	●		●	●		
GENERAL READING	12		●				●					●						●			
COMMITTEE MEETINGS	9		●			○		●			●				●					●	
ADMINISTRATIVE WORK	5		●			○		●			●				●			●	●		

* (6, 1961, P. 13-14)

CLASSROOM

A classroom is a physically defined space in which to learn. It should be near a source of teachers and tools of education such as books and media. The design of the classroom should be based on the learning and probelm solving processes of the student and faculty. "By giving careful consideration to the educational design of classrooms, educators can create environments that will extend for the individual student a range of working conditions which will serve to elicit his very best efforts at reasoning, discovery and skill development." (10, 1968, p. 67.)

Most classrooms fall short of their maximum use because they are designed for a single teaching method, lecture-demonstration. This use should be extended to accommodate seminar techniques as well. Utilization can be further increased by having furniture suitable for a variety of situations. As an example, if tablet arm-chairs were replaced with side-arm chairs and tables, the classroom could then also be used for other activities such as individual study, tutorial work, and conferences. The use of this space as conferences would mean a savings in cost since fewer spaces would have to be built specifically for this purpose. Another consideration in total utilization of the area is maximum use of wall space. It is important to think of the space three-dimensionally and not just the floor area. Wall space is needed for bulletin boards, blackboards, and cabinet and shelf space which becomes an integral part of the room not only through function but through feeling created by their texture.

As stated earlier in this paper, the classroom must be flexible in order to serve the needs of the university over any length of time. The chief of the Bureau of School Planning of the California State Department of Education, Charles D. Gibson, rates flexibility in five categories: 1. spatial - the type of freedom allowed, free-spans available in the building, interior bearing walls, etc.; 2. thermal - the flexibility of a mechanical system with regard to weather change and number of occupants; 3. visual - the efficiency and effectiveness of lighting and audio-visual equipment and its adaptability to changing situations; 4. acoustical effective stopping of unwanted sounds and variability of acoustical controls. 5. furniture

and equipment - the ease which furniture, including cabinets and shelves can be interchanged, moved and attacked. These five divisions provide a basis for an analysis of buildings for Gibson and gives me some basic considerations for making the building useable under several given circumstances.

The use of media in the classroom is becoming increasingly more important. Audio-visual equipment provided so many new methods of getting more information to a greater number of students that more complete use of media and media systems must be considered. In addition, the media must be easily useable by the instructor. The instructor should be the master rather than the "confused servant of the equipment." (2, 1963, p. 42.)

VISUAL MEDIA

When projected media are used, there should always be enough light sufficient for students taking notes to refer to materials and maintain eye-to-eye contact with the instructor. Alan C. Green, the Secretary of Educational Facilities Laboratories, said, "When projected media are used, the surroundings should be illuminated so there is not the constant physiological readjustment of the eye as it moves from very bright to very dark surfaces within the environment." (10, 1967, p. 40.) Carl Snow, Director of Western Michigan audio-visual center, places this level of illumination at a minimum of 25 foot candles. (4, 1969, p. 76.) Screens used for projected media can be U-shaped, front as well as rear, and overhead screens should be given consideration. Snow reccommends that screens be white and he says that an overhead screen for the normal class of 30-35 students should be about 70 inches square. He states further that no student should be seated nearer than 2 screen widths nor further than 6 screen widths from a screen and recommends seating be at an angle of no greater than 30 degrees from normal to prevent distortion. (4, 1967, pp. 76-78.) Ceiling height must be at a level that allows projection over heads which means a 9 foot ceiling in a classroom for 50 people is insufficient.

AUDIO MEDIA

Time will be coming when a student will be able to hook into a master random-access system of tape recorded instructional materials including class and quest lectures. This will probably be supplemented by closed, circuit television providing additional instructional programs. Closer to the present situation at Montana State University, use of microphone and other sound systems in the classroom can be provided for now. One way to limit sound level when using such media as a motion picture projector is to provide a series of low-volume speakers throughout the room rather than the typical, single, high-volume speaker. Snow also recommends this type of speaker set-up for a large classroom. This system helps to alleviate some of the sound control probelms created by moveable partitions. Another suggestion is the use of microphone outlets in large classrooms scattered throughout the room to facilitate student discussion. The important thing, as Snow said, is that ..."every attempt must be made to incorporate audio, visual convenience and effectiveness in classroom building construction." (4, 1969, p. 78.)

Reasons large group instruction with aids and media is sometimes preferred over small groups include: 1)With many types of learning, it is more efficient for staffing than small groups. 2) Preparation of special materials for instruction is usually more practical for a large group than a small one. 3) A variety of learning experience is afforded the student.

Several things must be considered in a space for a large group. Since much of the information presented to the student is through media, provions must be made for a display area, clear vision of this area, and future change of the display systems. The requirements for the students of clear vision of the display and ease of hearing mean that a rectangular space is impratical. Non-parallel walls improve the acoustics and optimum visibility is improved by converging the walls (and attention) toward the display area.

A large number of people in one place obviously creates circulation probelms. Entrance to the learning space should be in the rear so that demonstration equipment is not disturbed and so that people entering late don't disturb the class. Waiting spaces must be large enough to provide not only for students passing to and from the rooms but for those waiting to get in.

CLASSROOM SPACE FOR 2,000 STATIONS

SIZE	% of TOTAL CLASS HOURS	STATIONS PROVIDED	ROOMS
200	20%	400	2
100 75	35%	700	8
50	30%	600	12
30	10%	210	7
15	5%	90	6
	100%	2,000	

CLASSROOM FUNCTION ANALYSIS

SIZE OF CLASS / SPACE NEEDS	% OF TOTAL CLASS HOURS SPENT *	INTERACTION: TEACHER-TO-STUDENT (PRIMARILY)	INTERACTION: TEACHER-STUDENT INTERACTION	INTERACTION: TEACHER-STUDENT AND STUDENT-STUDENT INTERACTION	ACOUSTICS: REQUIRES EXTREMELY QUIET	ACOUSTICS: REQUIRES RELATIVE QUIET	ACOUSTICS: CAN BE IN NOISY AREA	ACOUSTICS: WILL CREATE HIGH NOISE	ACOUSTICS: WILL CREATE MODERATE NOISE	ACOUSTICS: WILL CREATE LITTLE NOISE	LIGHTING: NEEDS NATURAL LIGHT	LIGHTING: DOES BEST UNDER NATURAL LIGHT	LIGHTING: NEEDS CONTROLLED NATURAL OR ARTIFICIAL LIGHT	LIGHTING: NEEDS ONLY DARKENING-LIGHT	EQUIPMENT: NEEDS STUDENT WRITING SURFACE	EQUIPMENT: NEEDS STUDENT STORAGE	EQUIPMENT: NEEDS TEACHER WRITING SURFACE	EQUIPMENT: NEEDS T.V.	EQUIPMENT: NEEDS VISUAL AIDS	EQUIPMENT: NEEDS DEMONSTRATION AREA	EQUIPMENT: NEEDS SOUND SYSTEM
OVER 200 STUDENTS	5	●				●		●				●	●		●			●	●	●	●
100 – 200	20	●				●		●				●	●		●			●	●	●	●
50 – 100	30	●				●			●			●	●		●			( )	●	●	●
30 – 50	30		●		●					●	●		●		●		●		●	●	●
15 – 30	10			●			●			●	●		●		●		●		●		●
LESS THAN 15	5			●			●			●	●			●	●	●	●		●		

* ESTIMATED FIGURES

CIRCULATION

Circulation facilities, corridors and stairs in the building must not only provide its basic function of allowing people to get from one place to another but should provide a maximum interaction between faculty members and students. "Corridors and stairs account for approximately 20% of the gross area of college buildings." (8, 1961, p.2.) A basic goal of circulation facilities should be to allow passage by a group at class break-time to be the same rate as is permitted to an individual traveling during the class session. (8, 1961, p. 4.) A study made by the University Facilities Research Center at Madison, Wisconsin provided the following results: Classrooms at 66.67 percent of station capacity should have 4.0 square feet of corridor per station. Teaching and research laboratories at 100 percent of station capacity should have 6 to 7 feet of corridor width. Staff offices at 100 percent occupancy should have 3 feet 8 inches of corridor width. (8, 1961, p. 17.)

In order to formulate a basis for determining space relationships, I have made the following assumptions:

1. The major source of learning will, for some time to come, continue to be interaction among students and teachers.
2. The use of visual aids and media will continue to grow and must at least be allowed for, if not provided.
3. Spaces throughout the building must allow for maximum student-teacher interaction as well as student-student and teacher-teacher interaction.
4. Circulation spaces will provide for the above function as well as inter-department circulation.
5. Office space location provides an opportunity for teacher interaction with students and other teachers.
6. Large classrooms may be cut off from the exterior of the building.
7. Small learning areas should have exterior access, (visual, physcial, or both), to make the small space more free and less confining.
8. Preparation areas must be close to class areas and be easily accesible by teachers.

These assumptions are the basis for the following design criteria:

Wherever possible, corridors shall serve not only as passageways but, also as meeting and conversation spaces. This is an attempt to extend the classrooms, or learning situation, into an informal area to which both students and faculty can easily go and frequently pass by or through.

Classroom spaces will be designed to accommodate visual aids and media whether or not they are put into the areas initially. There must be a close, physical connection between preparation areas and learning areas to facilitate the moving of visual aid setups to the learning areas. Large learning spaces will be inwardly oriented spaces connected to other environments, i.e. islands with external connection only. Smaller learning

spaces will have at least visual extension into the exterior environment and may be connected physically to the extent of being parts of other spaces.

Office spaces should be near places students travel so that there will be more opportunity for student-teacher interaction. Conference and meeting places could be shared and joined physically with office space and circulation space to obtain greater interaction of people. The relationship of office to classroom is secondary to the relationship of teacher to student. Every opportunity to put the students and teachers together in an informal environment must be utilized.

site

The location of the building will obviously have a great effect on the activity on the campus and this fact affords an opportunity to shape the direction we want the campus growth to take. There are basically two ways this can go: 1. an outward-spreading movement with large, open spaces around each building; 2. an inward growth that ties the campus physically by expanding into previously open space within the presend bounds of the academic structures. While the university has the land for the first type of expansion, I am opposed to it since it makes traveling around the campus both time-consuming and in the winter very uncomfortable. (See the temperature and moisture tables p. 39.) Assuming the direction of inward growth, the maximum number of advantages this type of plan affords should be exploited. The two most obvious advantages are: 1. close, physical proximity to other activities; 2. a great decrease in people's exposure to weather as compared to a spreading plan. Other advantages are also present, such as more efficient use of land, greater economy in utilities, (because of more centralization), and greater liveliness of the total campus as more activities are put into a smaller space. Condensation of area for activity does not mean that the answer is a gigantic structure covering all the ground-surface. The inward growth I am suggesting creates a close physical relationship but maintains small areas of ground-surface that if developed, would add interest and variety to the academic spaces.

With regard to relationships of academic facilities, I think there are two choices of sites that provide the greatest number of advantages. The first site is the presently blocked off portion of Garfield Street and its boulevard. The second possibility is the large space surrounding the flagpole, and enclosed by the old gymnasium, the Math-Physics Building, Reid Hall and the chemistry buildings.

GARFIELD SITE:

Areas within close proximity: Library, Reid Hall, Montana Hall, Life Science Building (when completed), Hamilton Hall, and the Student Union Building.

Service access: Garfield would provide vehicular service access to the building. This would afford access on both east and west sides.

Sunlight: Sunlight reaches the entire area in the summer months but during the winter, shadows cast by the Library and Reid Hall reach into the center of the space.

Utilities: Gas, water, steam and phone lines are located along the center of the street. Electricity runs on a line between Montana Hall and the west side of the library. Sewage lines are located on the south side of Reid Hall.

Spatial feeling of the area: If the building was placed on this site, it would be the focal point of the Garfield entrance to the campus. This space is very linear with an east-west direction of movement. This linearity could be used to suggest visual penetration and motion into the heart of the campus as the building is viewed from any side.

FLAGPOLE SITE:

Areas within close proximity: Student Union Building, Math-Physics Building, old gymnasium, new and old chemistry buildings, Reid Hall, and Montana Hall.

Service access: Indirect access from Garfield Street, Grant Street, service drive behind Reid and the old Chemistry Buildings and service access between the Math-Physics Building and the Library. This means a reasonable access could be available from all sides of the space.

Sunlight: Sunlight reaches most of the area during all seasons. During the winter months, the southern end of the space is in the shadows cast by the gymnasium.

Utilities: Sewer and sanitary lines pass from the Library to the front of the Old Chemistry Building. Water and phones are along the east side of the chemistry buildings. Gas is available from Grant Street. Steam lines are at the front entry to the Old Chemistry Building running east-west through the gymnasium.

Spatial feeling of the area: The space is basically circular though it is open at the north end and has a north-south axis. The space is enclosed with small open spaces between the buildings providing relief from the enclosure as well as views of the surrounding areas.

I chose the Flagpole Site over the Garfield Site for several reasons. The most important factor is that a greater number of activities can be related to a building put on this site. Also important is that more of these activities are academic than administrative such as found around the Garfield Site.

Another factor is the shape of the space. The shape allows greater freedom in design and is more suggestive of the free-flowing interaction of activities desired in the project than the linear direction of the Garfield Site.

Sunlight conditions are also better in the chosen site. Not only is a greater amount of the area in sunlight but shadows cast by a building put into the space would not be as harmful. Since most of the sunlight in this area comes from a southern angle, the shadow cast is toward the north. Such a shadow on the Garfield Site would be cast on the south walls of Montana Hall and Hamilton Hall which receive most of the direct sunlight now reaching these buildings. A northernly cast shadow in the Flagpole Site would cover the south walls of the Library and Reid Hall which are nearly solid masonary; and such a shadow would therefore not affect the feeling of the innerspace of these buildings. (See the diagram on the following page.)

Although direct service access is better to the Garfield Site, access to the Flagpole Site is not sufficiently inadequate to be a greater probelm nor to outweigh the advantages mentioned above.

Utilities are available around the perimeter of the Flagpole Site making access to them no probelm. The utilities on the Garfield Site run primarily through the center of the site which requires that the building be built around them or that they be dug up and moved to allow for excavation. The latter choice would increase the cost of the initial phases of construction.

For the reasons stated, I am firmly convinced that this is the best site for the building. It offers a multitude association of activities which are largely academic, a shape that allows great freedom in design, and good access to the mechanical needs of the building.

TEMPERATURE RECORDINGS AT M.S.U.

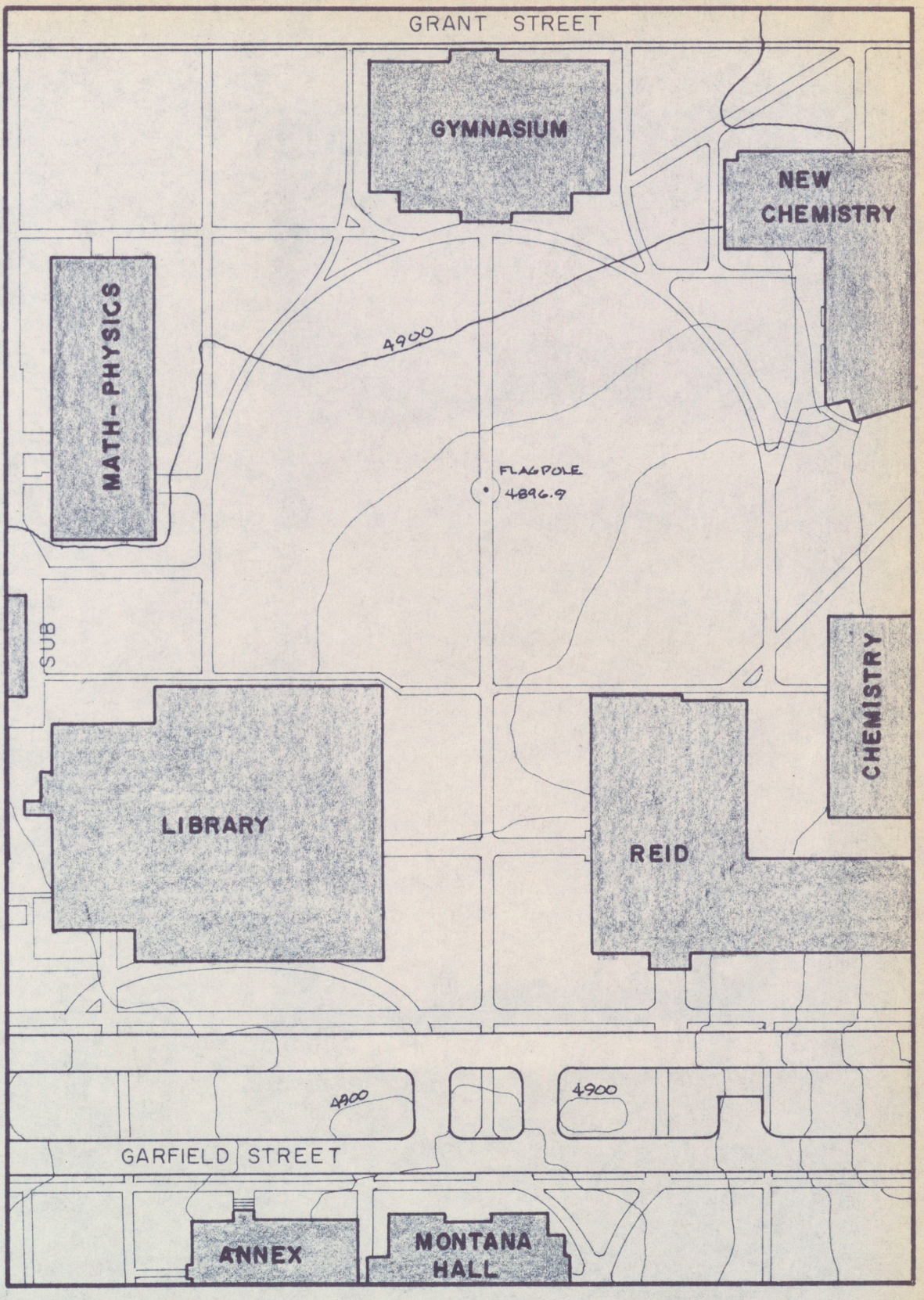
	MEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MEAN TEMPERATURE	43.3	20.3	23.8	30.1	42.2	51.3	57.7	66.4	64.9	55.8	46.0	31.8	25.4
DAILY MAX. TEMPERATURE	55.2	31.1	34.7	39.6	52.6	63.2	71.2	81.7	80.4	70.9	58.6	41.7	36.1
DAILY MIN. TEMPERATURE	31.2	11.4	15.0	18.6	29.6	39.0	43.5	51.8	50.0	49.1	33.5	21.4	16.6
MEAN NO. OF DAYS $\leq 32°$	187	30	27	29	21	6	1	—	—	3	14	26	30

(14, 1965)

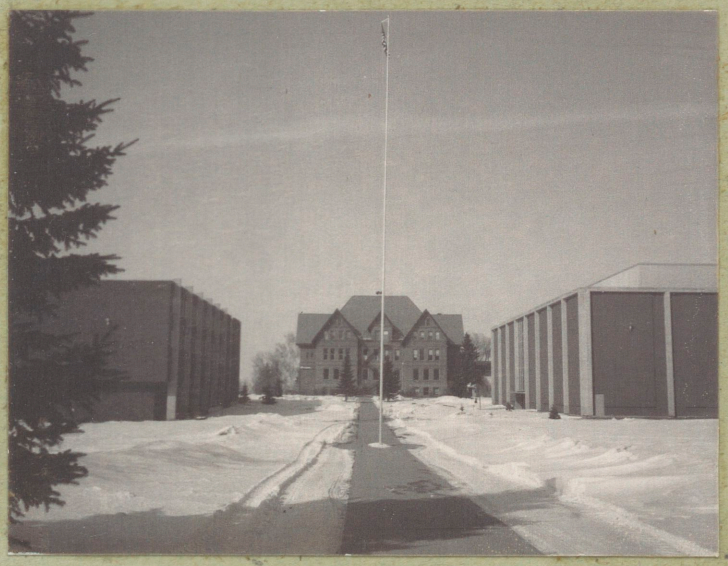
PRECIPITATION RECORDINGS AT M.S.U.

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NORMAL PRECIPITATION	17.38	0.90	0.74	1.52	1.73	2.34	2.95	1.14	1.17	1.60	1.40	1.05	0.87
TOTAL SNOWFALL	51.7	10.1	7.5	10.3	5.8	2.4	—	—	—	0.6	2.4	4.7	7.9
MEAN NO. OF DAYS WITH PRECIPITATION ≥ 0.10 > 0.50 IN.	49	2	2	5	5	7	6	4	4	4	4	3	3
≤ 0.50 IN.	8	—	0	1	1	2	1	—	1	1	1	—	—

(14, 1965)



SITE PLAN SCALE 1"=100' C.I. 2'0"



LOOKING NORTH
FROM THE GYM



LOOKING EAST FROM
REID HALL



LOOKING SOUTH
FROM REID HALL



LOOKING WEST
FROM THE GYM

aesthetics

Any architect's design includes not only accommodations for function but also accommodation for interest, excitement and variety. Providing for efficiency and function is an almost mathematical process. A good design goes beyond this level and provides for human delight.

The classroom and its immediate surroundings must provide for shelter from weather, acoustical control, space for lecturing and taking notes, and space to get from one area to the next. When all of these needs are met, the building will efficiently house the activities it was designed to house but may still be dull and uninspiring. A place of learning must be a place that is interesting, promote interaction of people, and helps overcome stagnation in the minds of those learning and teaching there. This is not a totally functional probelm and must be solved through creativity. That is to say, there is no one best way to make the building a fun place to be in or near.

Decisions such as the manner in which to provide an informal surrounding for non-academic student-faculty discussions is an aesthetic concern, although the choice to have such an area is a functional concern. Another example of this type of decision is the problem of introducing a feeling of freedom into the building. This is a quality I think is important to have in a building for learning and it can be solved through a variety of directions, (visually open, variety in space, actual physcial openness, etc.) However, this is not a functional requirement but an emotional reaction I want the people using the building to have. Freedom is important because it can help add variety to the space and thereby oppose feelings of stagnation.

In addition to emotional reaction, appearance is a basic concern. How well this building fits in with the surrounding buildings and the total campus is one of the first probelms of appearance. The design of the building can be in one of two basic directions. I can try to design a building that is in contrast with its surroundings while keeping the total area a unit working together. The second choice is a building that has the same or similar visual effects as the surrounding buildings. Also the horizontal lines and rhythm developed through verticals of the surroundings would be used on the new building. Either choice, similarity or contrast, is a valid approach and, at the present, I am leaving this choice open.

If a physical link is made between the new building and any surrounding buildings, the connection is of vital importance visually. Such a link must appear as not belonging totally to either building, old or new, but as an extension of both. This, again, may be acheived in a variety of ways but in order to be successful, the link must contain some of the elements of both buildings such as a similar rhythm, the same horizontal lines, or similar treatment of details.

In review, I want this building to give people an emotional response of freedom and vitality and this may be accomplished in many ways. The outward appearance of the building can either contrast or be similar to surrounding buildings and either choice is valid.

economics

A balance between human and economic factors is the goal I must strive to achieve. Neither function can be totally sacrificed for the other. A purely artistic masterpiece would not get built for the needs of a class area, nor does "the coldly perfect building" seem "to fit into the environment of learning." (2, 1966, pp. 46.) "Planners and designers...must pay more heed to social and psychological needs of the student, to more rewarding interaction between student and teacher, to relative claims of solitude and community, to providing a vigorously intellectual social climate," (2, 1966, pp. 165.)

Another great problem is planning for tomorrow. Planners and educators seem to agree that college facilities must be adaptable to the changing process of education. It is very doubtful that what is wanted today will be wanted in 20 years. The building should have a maximum efficiency in use for the campus. Where possible, spaces should be designed for double and triple use. At present, most colleges use their space at only 40% of maximum capacity. (13, 1961, pp. 26.) This means that the building must be used as a more total environment encompassing not only the formal-teacher-to-pupil relationships of the past, but informal student-teacher relationships and student-student relationships. "The most successful instructional facilities are more than brick and mortar. When they are appropriate to the individual college, they can become teaching tools in themselves." (2, 1966, pp. 48.)

The cost of a building involves more than the intial cost. This fact is even more pronounced in school buildings where the building will receive heavy use and is expected to last a fairly long period of time. Design decisions are going to be influenced by 3 economic factors: 1. Intial cost, 2. Maintenance costs, 3. Adaptability to the changing needs of education. A reasonable balance between intial cost and long-range maintenance must be reached while choosing materials and systems. The third factor, adaptability, may not affect the intial cost but if not planned for, will certainly increase the long-range cost of the building. The design should allow for fairly rapid changes in the building to provide a maximum efficiency in its use. Less immediate flexibility, such as revisions that could be made between quarters, should be allowed for at the start to elminate large costs caused by major changes to the building.

The projected budget for the project is shown on the following page. The money for the building being requested from State bonding supplemented by Federal grants. Any further discussion of funding is beyond the scope of this project with the notable exception of a cost estimate of my design to be provided as the design reaches a definable structure.

PROJECTED BUDJET FOR THE OFFICE - CLASSROOM BUILDING

Preliminary Expenses (site survey and soil testing).....	$ 2,800.00
Administrative and Legal Expenses.....	$ 500.00
Furnishings and Special Equipment.....	$ 60,000.00
Consultant Services.....	
Landscaping and Site Development.....	$ 50,000.00
Construction Costs.....	$1,980,000.00
A/E Services.....	$ 140,000.00
Contingencies.....	$ 70,000.00
TOTAL PROJECTED COST.....	$2,301,300.00

This budget includes compensation for inflation and increased construction costs projected to occur by 1972. This budget is taken from Space for the Seventies pp. 9.

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summary

Carl P.

This office-classroom building houses 2,000 classroom stations and the offices for the departments of English, Speech and Theatre Arts; Mathematics; Sociology; and History, Government and Philosophy.

The building is an attempt to provide a free-flowing space that serves the individual. I have tried to make pedestrian traffic more pleasant, physically and aesthetically, than the present campus development provides. To do this, I chose a site that had the most academic facilities in closest proximity. Enclosed connections are made with both Reid Hall and the Math-Physics building and a breezeway connection is made with the New Chemistry building. This means that in the winter more people will be able to stay inside more of the time than was possible before. However, a totally interior space is not the answer either, so plaza space is provided as an option to traveling through the building. The plaza areas provide more than walkways; there are places for group discussions, outdoor classes, and places to sit alone.

The site has a feeling of openness which I did not want to destroy, so I sunk most of the building one-half level below grade. Courts, changes of surface treatment, seating groups and trees are used to make spaces interesting and give relief from an otherwise barren sea of paving.

I tried to provide spaces in the interior of the building that are more conducive to effective learning as well as increased interaction of people using the building than is currently provided on the campus. Offices are relatively close to the classrooms and are in areas where people will be in order to promote interaction of people. Discussion areas are provided throughout the building to give a middle ground between classrooms (and offices) and pure fun where students and faculty can meet and discuss academic matters informally. I hope this will help make the building a place one would go to rather than from to have a

relaxed discussion with classmates, faculty, or both.

Many classrooms are designed for media with the large rooms having media preparation areas adjacent to them. This should allow for better class presentations that create less disturbance to the class since much of the preparation can be done behind the scenes as it is actually happening. Other classrooms have conventional furniture (arm chairs and writing desks) so that they can double as conference, seminar, and private study areas. In this way, rooms can be used a greater amount of the time making the building more effective.

I have tried to make the building alive and full of activity, a place not only to learn in the classrooms and work in the offices but a place to freely exchange ideas.

Sincerely,

Carl E. Peterson

Carl E. Peterson

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