6-2-1962

A Planetarium and Library of Space Information

Stanley G. Moore

A PLANETARIAM AND LIBRARY OF SPACE INFORMATION • MOORE

1962

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A PLANETARIUM AND LIBRARY OF SPACE INFORMATION

BY

STANLEY G. MOORE

BACHELOR'S THESIS

Presented to the faculty of the Department of Architecture, University of New Mexico, in partial fulfillment of the requirements for the Degree of Bachelor of Architecture.

The University of New Mexico

June 2, 1962

Thesis Committee:

John J. Heimerich

George S. Wright

Harold R. Benson

BACHELOR'S THESIS PROPOSAL

BY

STANLEY G. MOORE

TITLE

A Planetarium and Library of Space Information

LOCATION

Albuquerque, New Mexico

PURPOSE OF THESIS

A new age of exploration is inevitable. This age is one of space exploration. The public is extremely interested in the efforts of the United States and the U.S.S.R. to make this age become a reality and this interest will undoubtedly increase as man is able to project himself further into the macrocosm. The study of astronomy will gain added interest from the public as man develops his ability to travel in space. A knowledge of astronomy will become essential to follow the routes taken by space travelers. Man, being a curious creature, will also desire knowledge of what has been discovered by these explorers of space.

The public needs a place where astronomy may be studied and documentary records of space travel and exploration may be reviewed. Therefore, A Planetarium and Library of Space Information is proposed.

SECTION 1: THESIS PROPOSAL

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THESIS CONTENT

The thesis will be composed of research and design. The research will include studies of existing planetariums, library science, and of special problems related to display of documentary information.

1. Proposal
2. Research
3. Statement of the Problem
4. Preliminaries
5. Final Design
6. Conclusion
7. Bibliography

Approved:

Chairman, Faculty Committee
Department of Architecture
The University of New Mexico

CONTENTS

introduction

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PLANETARIUM DEFINED

A planetarium is an educational tool useable both by students and by the general public. There is no other more important aid to the teaching of astronomical subjects.

The planetarium itself may best be described as a theater with a domed ceiling onto which a projector casts a reproduction of the sky; the stars, planets, sun and moon, in their relative positions and brightness as they are seen from earth. The projector can be regulated to reproduce the appearance of the sky from any vantage point on earth, at any period of time, and at any season of the year; and can also be regulated to show the movement of the stars and the planets, in relation to the rotating earth, over a period of time.

The planetarium, unlike an observatory, is not limited by the weather conditions or by the particular appearance of the sky on a particular evening. Large groups are able to view the sky reproduction simultaneously at any time during the day or night, which is not possible with a telescope. By integrating entertainment with education, the planetarium provides a dramatic stimulus to learning; it attracts and holds the attention of audiences of all ages, thus promoting an interest in science among both students and adults. The dramatic effect of the planetarium on the observer is unequalled when the picture on the dome is combined with narration, music, and special lighting effects.

The planetarium contains more than a projection room. The building should provide additional means for the study of astronomy and space such as special exhibits, photographic murals, instrument models, work shops, study areas, lecture halls, and a library. The planetarium should be considered a center where anyone may go for astronomical and space information and for research by the student.

NEED

The entrance of man into the age of space exploration is no longer a question in the mind of any individual. Progress towards man's conquest of space travel is made rapidly. Between the time of the original proposal of this thesis and its writing, the United States projected its first astronaut into orbital flight about the earth. With the advent of such rapid progress into the field of space exploration, the public is interested in new developments. Never before in history has a field of science enjoyed such a rapid and universal growth in popularity as astronomy. It is of prime importance that all students know more about the earth on which they live and the realm of space to which their future lives may be increasingly oriented.

The community is aware that our national survival requires comprehensive science programs. Responsible educators and citizens in general feel that an understanding of our solar system and of outer space is a necessary educational pursuit for students. Today

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children are dependent for their preparation for life on a generation of adults with little or no background training for the space age. Teachers and parents need planetarium instruction before they can guide the study of their charges. A planetarium would provide for this need.

A planetarium would help to identify Albuquerque as a city that recognizes and responds to the needs of the time, and would help give the city added cultural status. Not only would a planetarium serve Albuquerque's citizens, but would attract visitors from throughout the state. With the proper facilities Albuquerque could become a center for the study of astronomy.

assumptions

assumptions

FUNDS

The assumption is being made that funds for a planetarium would be available. Funds for such an endeavor are usually acquired through public subscription, bond issues or by endowments made by an individual or organization.

SITE

The site chosen for the planetarium is located on land owned by the Albuquerque public school system and lies immediately northeast and southeast of the Albuquerque Public Schools Administration Building and just off Roosevelt Park.

A planetarium should be considered an educational facility and as such should be accessible to all schools. It is impossible to place such a building in close proximity with all schools but it is desirable that it be centrally located with regard to their locations. In addition to fulfilling this requirement, a planetarium in this location would become an addition to a complex of educational adjuncts existing in this area.

This site is easily accessible to the public from major arterials but is far enough removed to eliminate the distraction of noise and vibration from traffic. The desirability of the site is further enhanced by adjoining Roosevelt Park, one of the most beautiful parks in the city.

PLAN

The assumption for this study was that a [illegible] would be [illegible] available. Funds for such an endeavor [illegible] would [illegible] public subscription [illegible] or by [illegible] or [illegible] corporations.

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educational program

ELEMENTARY EDUCATION

Elementary school science is now being recognized as a basic subject and not just a hobby. It must be made interesting and intelligible to children while they are young enough to incorporate it into their basic sense of values. Visual education is extremely valuable in teaching the young. Teaching aids to be used acquainting the student with astronomy are important because the child is able then to observe, measure, chart and record. Text book instruction must be supplemented with visual experiences which add fuller understanding of the subject.

A trip to a planetarium brings to life many exciting aspects of astronomy that the child might otherwise find uninteresting and consequently forget. The planetarium program for the elementary grades might include such subjects as "Animals in the Skies," "The Sky over Albuquerque," "The Christmas Star" or "A Trip to the Moon." No matter what the program topic might be, it will enrich the child's knowledge and promote his interest in astronomy.

SECONDARY EDUCATION

Astronomy in the past has been taught in secondary schools only as a part of a general science or physics class. However, quite recently, many high schools throughout the United States have started offering astronomy as an elective or as an extra-curricular class.

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The use of a planetarium for instruction in a high school is now

limited to astronomy classes but can also be of supplementary value in such courses as meteorology, world geography, and solid geometry. Most secondary schools today encourage the student to accept projects to be done outside of class. The results of such work is usually evidenced in student science fairs. Students with special interests might prepare special lectures to be given at the planetarium while others might use a workshop to build their own astronomical instruments. Many of our satellite tracking teams are composed of interested science students who devote their time to a worthwhile venture. The students would find a planetarium of great use in training new team members or in producing their own instruments.

COLLEGE EDUCATION

The value of a planetarium for teaching astronomy at the college level is quite similar to its use in high school. Through its use, difficult concepts which create problems in teaching and learning about outer space may be clarified. Concepts such as curved surfaces, unusual time and distance scales, motions viewed from a moving object, and an unusual perspective of earth become easier to grasp. Instructors in surveying and R.O.T.C. navigation find the use of a planetarium expeditious in teaching certain aspects of these subjects. Graduate students in meteoritics and astronomy find the planetarium to be a tool invaluable in their preparation for a teaching or professional career.

Failed to extrapolate classroom lessons to real situations.

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GENERAL PUBLIC

A program designed for the general public is the most difficult type to prepare. Many such programs are designed as a series of lectures over a period of time which will give the public some general knowledge of astronomy. As much drama as possible must be injected into the lectures to captivate the audience. An audience which has been entertained will return again for the next lecture and in time will gain some understanding of the universe. Many times throughout the year, special programs may be scheduled such as a "Christmas Star" program.

Quite often specific groups call on the planetarium for special showings and these can be provided when the program doesn't interfere with the educational programs. Astronomy clubs may wish to hold meetings at the planetarium or may wish to use the workshop for building instruments. The use of the planetarium by the public is limited only by the imagination and interest of the public.

GENERAL PUBLIC

A program designed for the general public is usually a difficult one to present. Many such programs are designed as a series of lectures over a period of time which will give the audience general knowledge or awareness. As such areas as pollution can be injected into the lectures to emphasize the subject. In many areas which has been overexploited will receive scant attention in lectures and in time will gain some understanding of the problem. Many times throughout the year, special programs may be held such as a "Children's Zoo" program.

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exhibits

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No planetarium is complete without exhibit space. Many planetariums have exhibits of two types, permanent and temporary. Exhibits of a temporary nature are most important because they should be correlated to the particular teaching program in which the planetarium is engaged. These exhibits should augment and supplement the lecture program and put the visitor in the proper psychological mood for viewing a planetarium show. The new interest in space travel demands large exhibit areas and might become the most important exhibit subject in the overall plan.

New information on the sun's radiation, the atmosphere and radiation dangers to man; more precise measurements of the continents and the distances between them, are all data which relates to the subject matter of other exhibits and exhibits of any one of these will greatly enhance any other temporary exhibit. These subjects would be relevant to others on sunlight and growth, the atmosphere and weather, geography and history or the biology of man. As man is able to reach the moon and other planets, exhibits might include the geology of the moon, the geography of Mars, or the atmosphere of Venus. Other exhibits could include new methods of space travel, nuclear rockets, or relay stations in space.

Possibilities for exhibits are unlimited and full advantages should be taken for their use as an educational tool.

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architectural problems

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PLANETARIUM DOME

The first consideration in the design of the ceiling is the selection of a projector. The projector chosen dictates the size of the dome because all the lenses in the instrument are ground with a fixed focal length. The shape of the planetarium ceiling must be hemispherical to allow undistorted projection of the celestial sphere and must be surfaced with a material possessing the best in light reflecting qualities.

The skyline or bottom of the dome should be no higher than is necessary. The ideal would be just slightly above eye level when the viewer is seated. Since it is not desirous to have doorways extend into the projection surface, it becomes necessary to have the dome spring line above the door head.

PLANETARIUM FLOOR

The planetarium floor requires comment. It should be dark and dull to avoid reflecting light and should be reasonably easy to maintain.

ACOUSTICS

Noise control is of paramount importance. The greatest difficulty seems to arise from the operation of air conditioning units, both from cooling and warming the area. Restrooms, compressors and motor driven equipment should be placed far enough away from the chamber to prevent transmission of vibration and rumble into the chamber itself. Duct work should be interrupted with fabric and insulated to cut down transfer of noise through them. The ducts must also be

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The height of the bottom of the dome should be as lower than is necessary. The ideal would be just slightly above eye level when the viewer is seated. Since it is not feasible to have dormers and the like on projection surfaces, it becomes necessary to have the dome starting line above the eye level.

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large enough so that the volume of air passing through them creates no hiss or roar.

It is desirous that the ceiling surface be acoustically treated in some way. In the case of plaster ceilings, acoustical plaster may be used; if a perforated metal ceiling is used, then it should be backed up with acoustical felt to absorb the sound. The perforated metal ceiling in addition to being good acoustically, permits the handling of exhaust air through the multitude of tiny holes.

Walls also should be acoustically treated by some means. Further sound dampening could be accomplished by carpeting the floor but this would increase the maintenance problem.

VENTILATION

Proper ventilation is of course of prime importance in the chamber as it must necessarily be completely closed for light tightness. Air circulation can be achieved in several different ways, but noise control in the system, as previously mentioned, is the special problem in this case.

LIGHT TIGHTNESS

The planetarium chamber should be capable of complete blackout. Light tightness seems to be difficult to attain. A person's eyes, when completely dark adapted, are capable of seeing even the smallest amount of light. All doors that are not light trapped should fit perfectly in their frames. If the dome is perforated, care

must be taken that no light is transmitted from another area.

SEATING

Various types of seating have been used in planetaria. Standard theater seating has been used with the adaptation of shortening the back legs so that the viewer sits tilted back for more comfortable observance. Custom reclining chairs and benches have been designed for some planetaria. The seating in some of the smaller planetaria is comprised of folding metal chairs. However, the most comfortable viewing position for the viewer is one reclining or nearly so. Desk type chairs or the chaise lounge would be very desirable for seating if sufficient space is available. Probably the most ideal situation would be the complete absence of any type of seating, thus allowing the viewer to assume the viewing position most comfortable to himself on a carpeted floor.

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program requirements

program requirements

PROGRAM REQUIREMENTS

PLANETARIUM CHAMBER	To accommodate Spitz A-3-P Projector	
	30 feet in Diameter (approx.)	
	ISTP Planetarium	
	40 feet in Diameter	
LIBRARY		
	READING ROOM	-- for 40 Persons
	STACKS	-- 1000 sq. ft.
	AUDIO-VISUAL ROOM	-- for 12 to 15 Persons to view microfilm, movies, and listen to recordings.
	AUDIO-VISUAL STORAGE	-- 500 sq. ft.
LECTURE HALL	for 60 Persons	
EXHIBIT SPACE	6500 sq. ft.	
FOYER	1500 sq. ft.	
ADMINISTRATION		
	GENERAL OFFICE	300 sq. ft.
	DIRECTOR'S OFFICE	100 sq. ft.
	ASSISTANT DIRECTOR'S OFFICE	100 sq. ft.

MECHANICAL EQUIPMENT		600 sq. ft.
WORKSHOP		1500 sq. ft.
STORAGE		1000 sq. ft.
TOILETS		
	MEN	100 sq. ft.
	WOMEN	100 sq. ft.
PARKING		75 cars

concept

concept

A planetarium building is a unique structure. The exterior design is usually conspicuous. The form should visually express the purpose of the building and convey an idea of its primary function. Elements of secondary functional importance should be expressed as such but integrated in a manner which suggests their relationship to the planetarium proper.

The structure, to be effective, should be interesting and inviting to the visitor so that he will have a desire to explore the mysteries within.

Interior circulation must be simple to avoid confusion for the visitor and through the use of well placed exhibits he will be conducted through the building without any conscious effort.

conclusion

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The planetarium is located prominently at the highest elevation on the site to increase its visibility to passers-by on neighboring streets. The vertical element, containing the planetarium chambers and exhibit space, emphasize their importance. A lower element penetrating it suggests secondary importance designated to the remaining facilities.

The circulation pattern for the visitor is initiated in the foyer exhibit area and proceeds vertically to the planetarium exhibit area on the second floor. The planetarium exhibit area is the nucleus of the circulation pattern. From this area the visitor may enter the planetarium chambers or circulate into the permanent exhibit area and lecture hall or to the administrative offices or the library. The shop has been located in a position most remote from the planetarium area to limit noise interference. Because the shop is to be used by the staff for exhibit preparation and by astronomy clubs and students for projects, it was necessarily placed at the most remote area in the circulation pattern.

Two types of planetaria were employed in the design. The Spitz model A-3-P planetarium was employed in the conventional useage. With the advent of space travel, Spitz Laboratories has developed a new type of planetarium, the Intermediate Space Transit Planetarium. With this new instrument, the observer is not restricted to view the heavens from the earth. The heavens and the earth may be viewed from the moon or from any location between the earth and

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moon at any period in time. The I.S.T.P. planetarium also permits the lecturer to project the part of the sky which is of greatest interest on that portion of the dome that is most conveniently viewed by the audience. Thus the usual planetarium problem of neck craning is eliminated. Any part of the celestial sphere can be placed on any portion of the dome. This feature permits the reorientation of the planetarium seating to increase the viewing control and to permit multiple use of the planetarium chamber.

The library, in addition to its conventional use, has been provided with special audio-visual equipment. Individual units provide automatic control of audio-visual material for the library visitor.

The automatic audio-visual unit is a closed circuit television unit. Each individual unit is equipped with a selector keyboard which sends impulses to a console containing audio-visual material on television tape. The operator locates the desired material in the card catalog, then the library classification number is punched out on the numbered buttons of the selector and relayed to the tape console. The correct tape is automatically selected and played back, the operation being similar to that of a jukebox. As the tape is played to the operator, he may stop it temporarily, reverse it for review, or reject it at will.

The automatic use of audio-visual material relieves the librarian of the job of handling this material and allows the visitor to view any films without waiting for a special showing. Larger units in

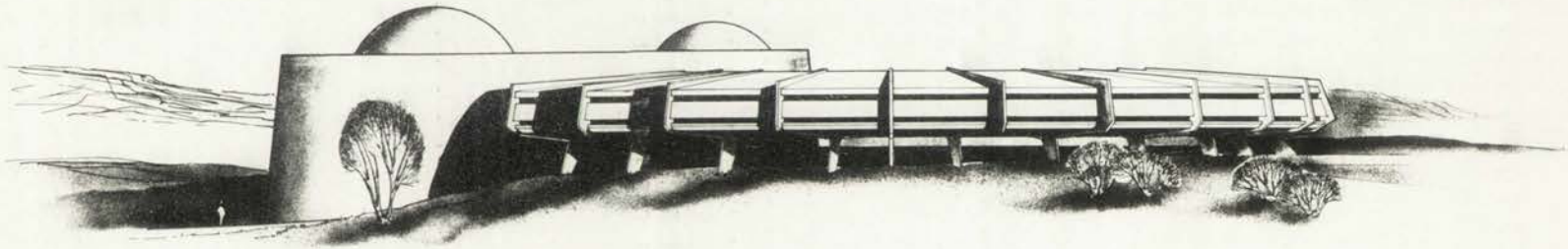
the planetaria and lecture room would eliminate the need of a projectionist. The lecture room does not need a projection booth and need not be darkened.

A special outdoor observation platform has been provided for night-time lectures in fair weather. This area can be used advantageously to point out actual stars visible to the naked eye or for telescope observation. When the lights inside the planetarium are turned out, this area is shielded from outside sources of light which hamper stellar visibility.

The principal material used in the construction of the building is concrete employed both structurally and decoratively.

drawings

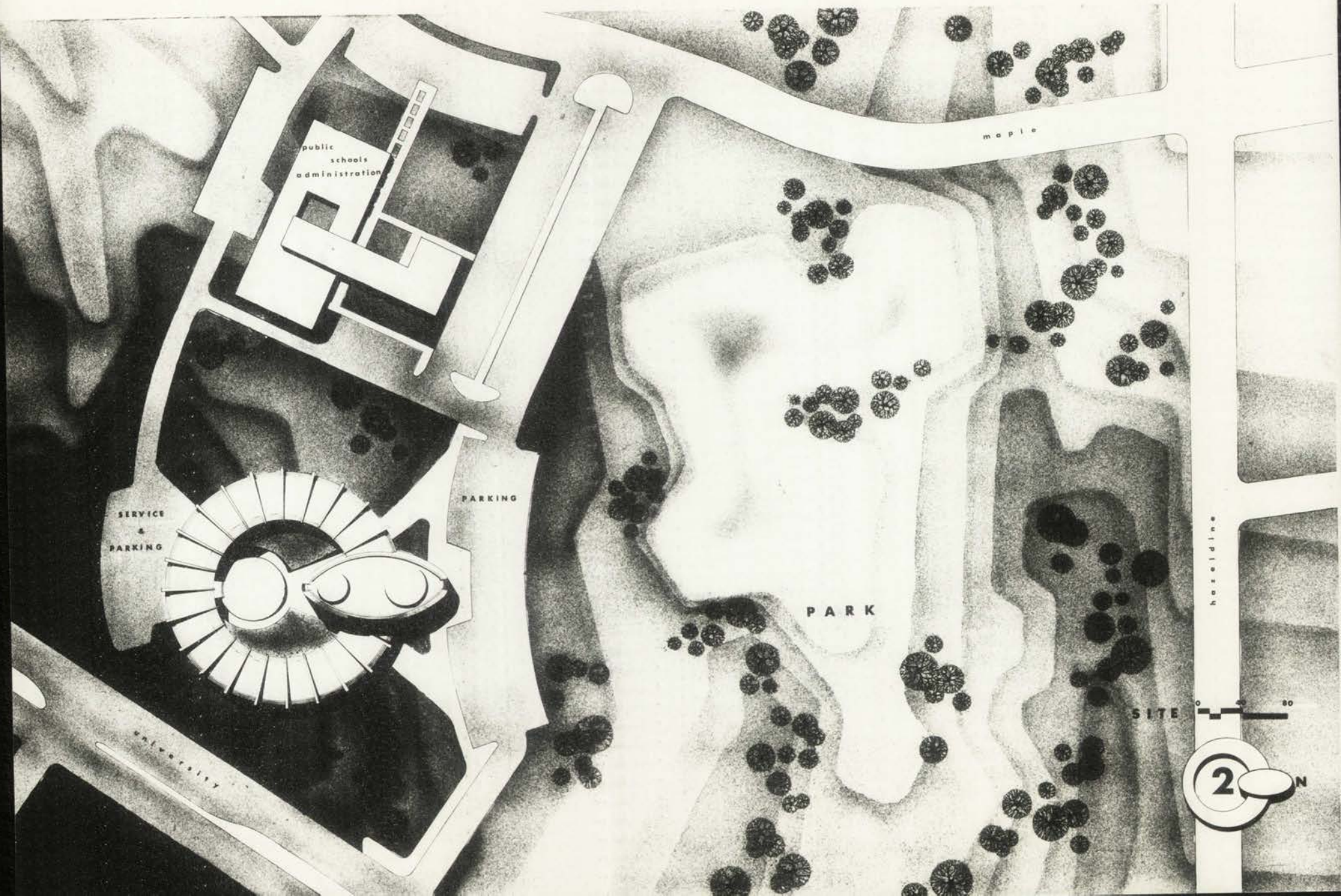
drawings



PLANETARIUM & LIBRARY OF SPACE INFORMATION FOR ALBUQUERQUE, NEW MEXICO

1

BY STAN MOORE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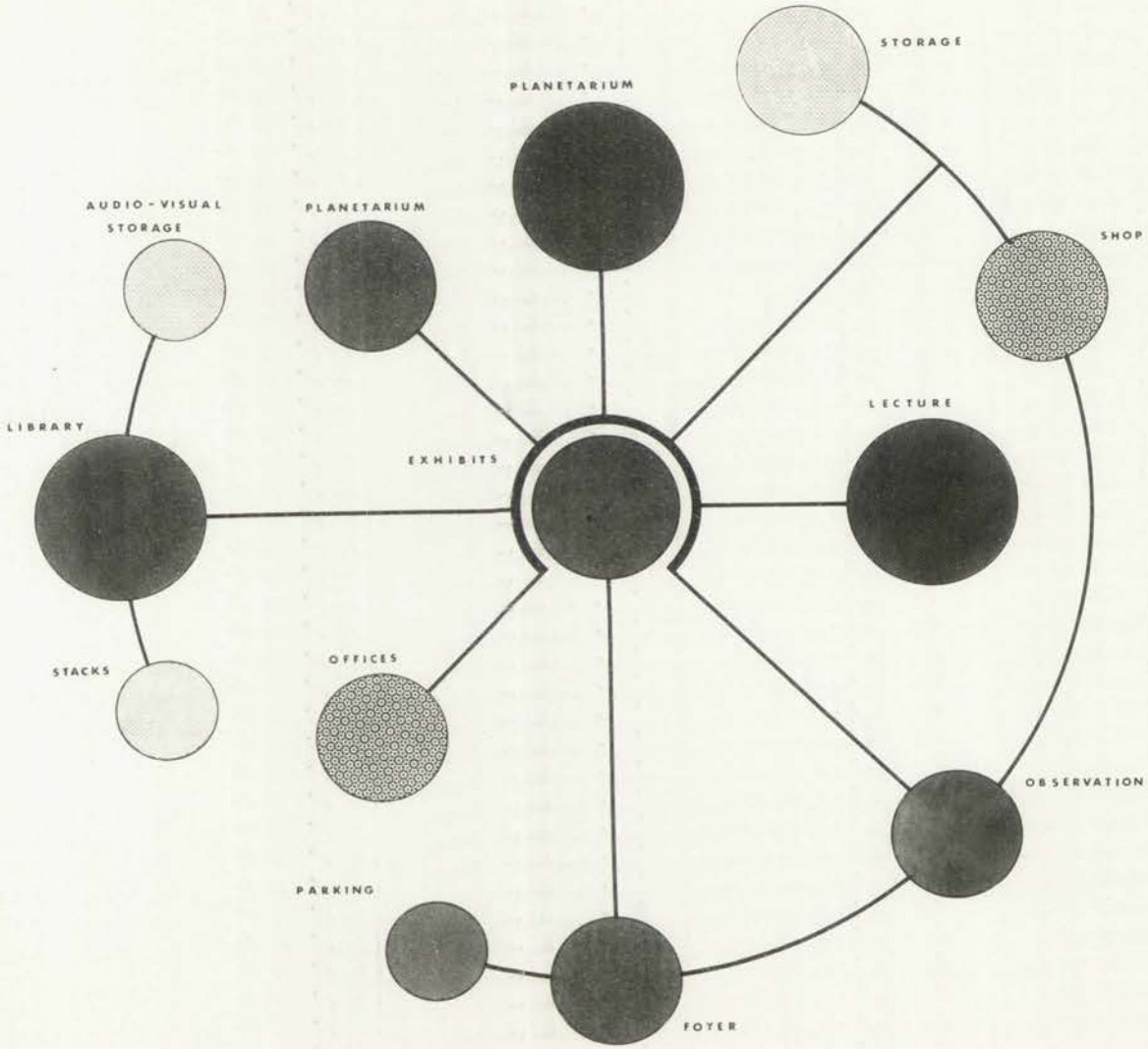

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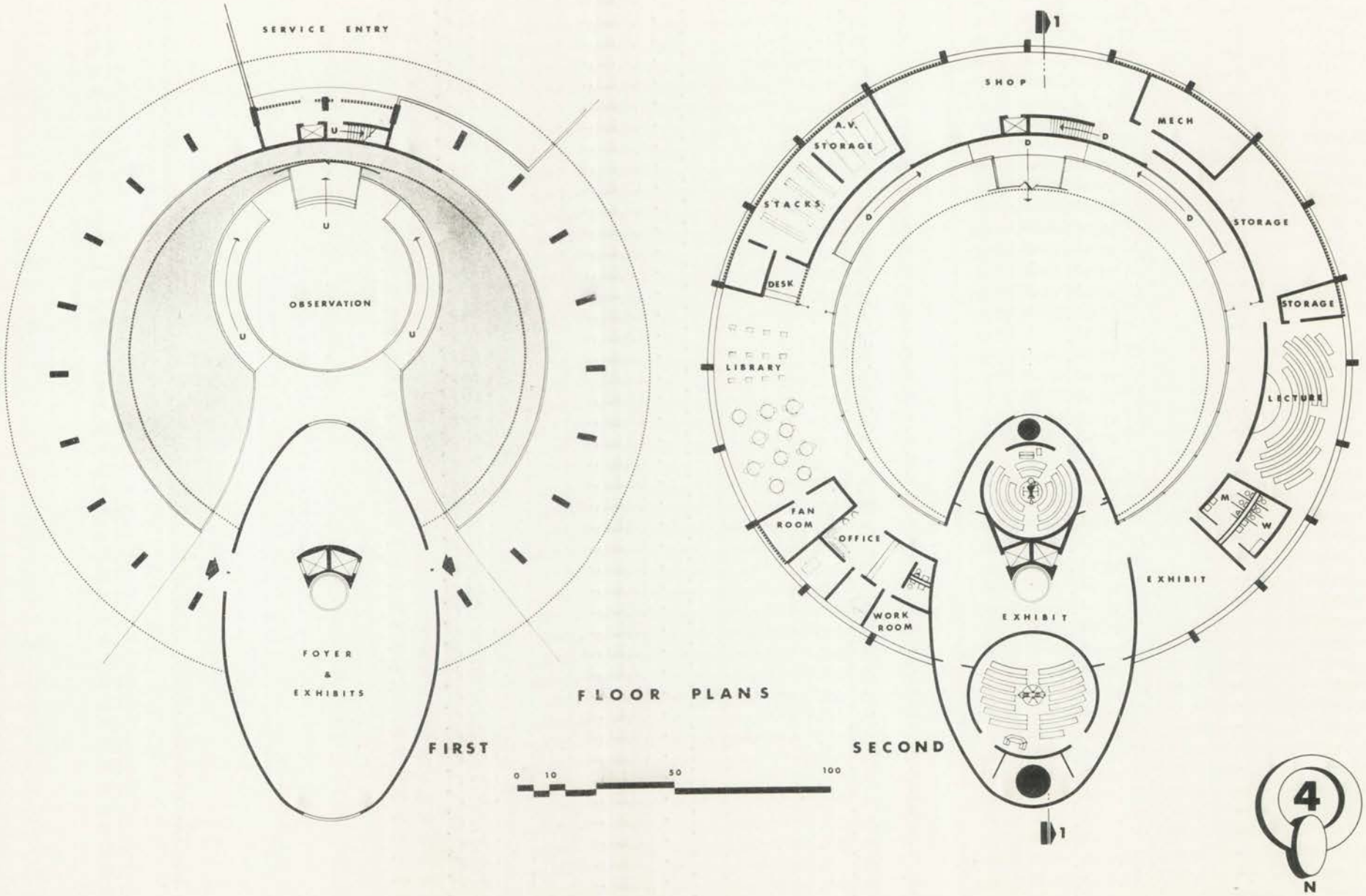
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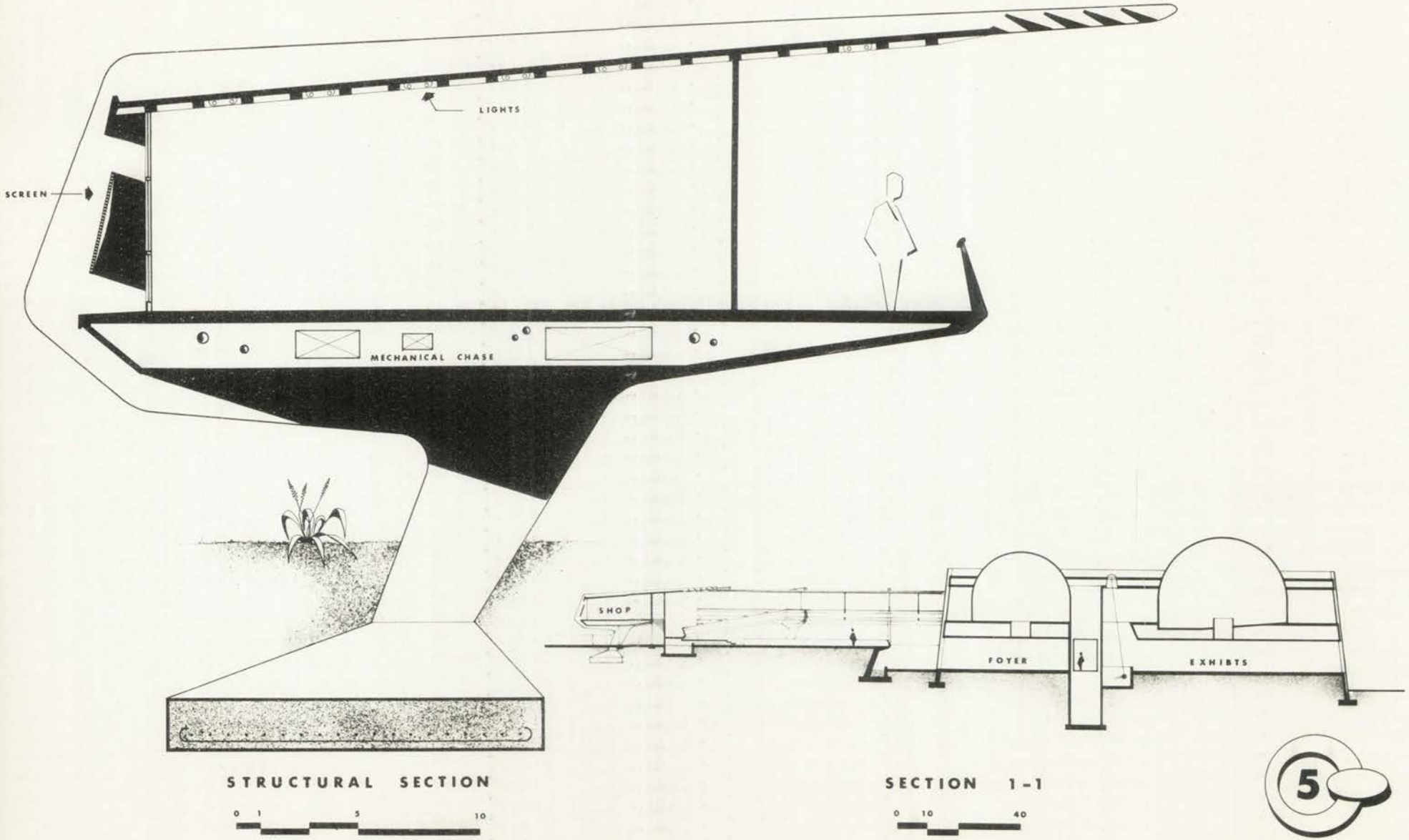
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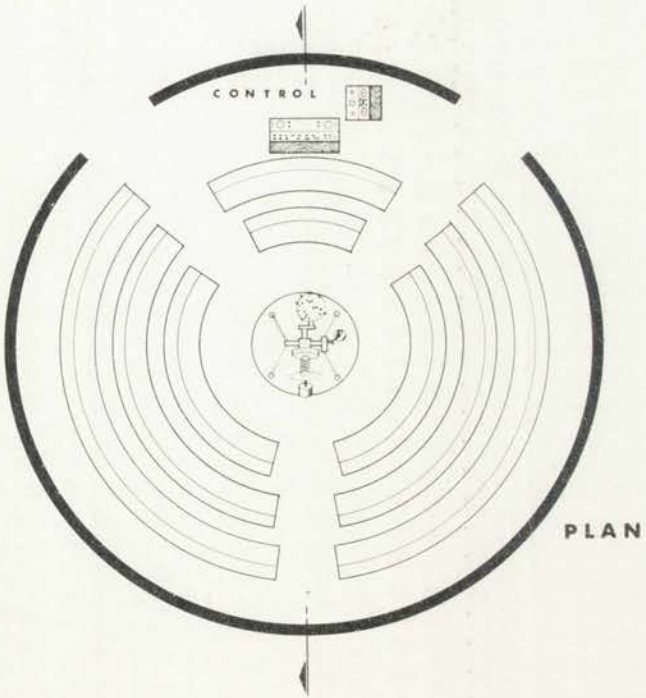
SPITZ A-3-P PLANETARIUM



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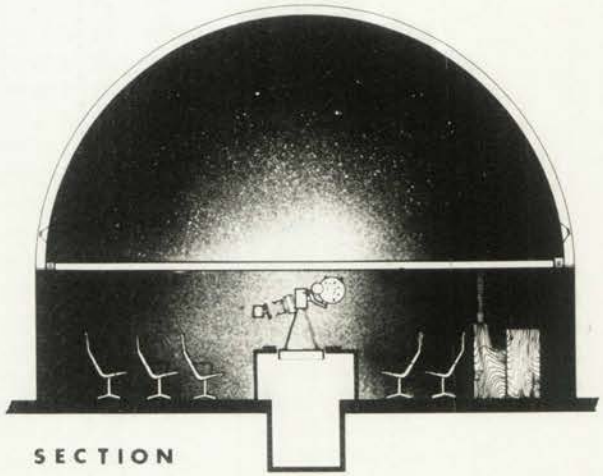
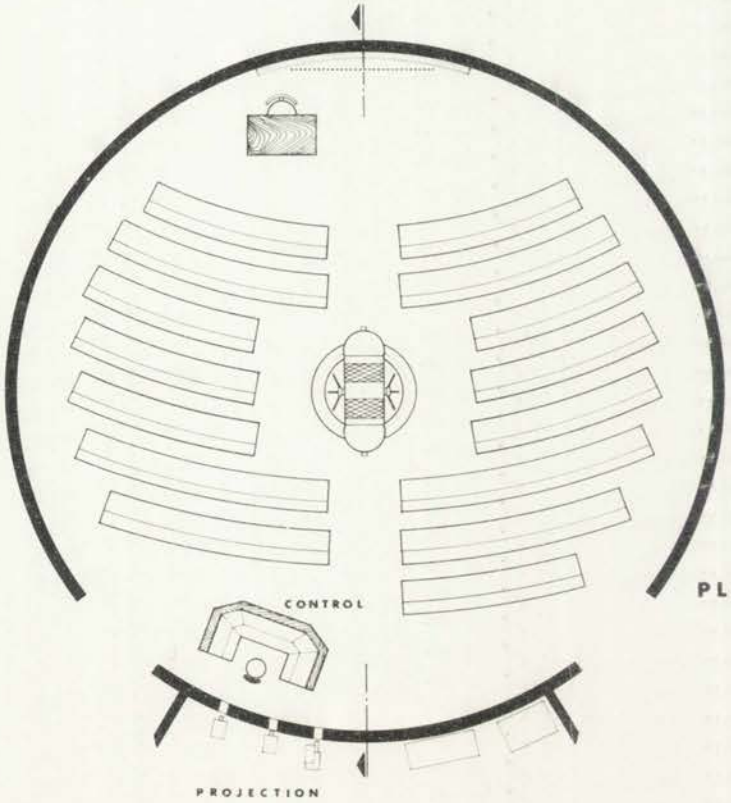
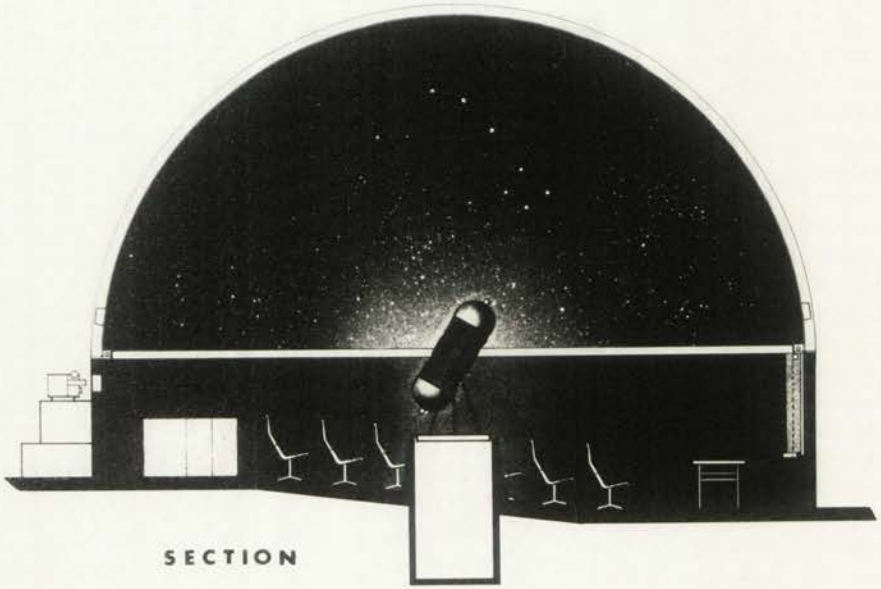


SECTION

INTERMEDIATE SPACE TRANSIT PLANETARIUM



PLAN



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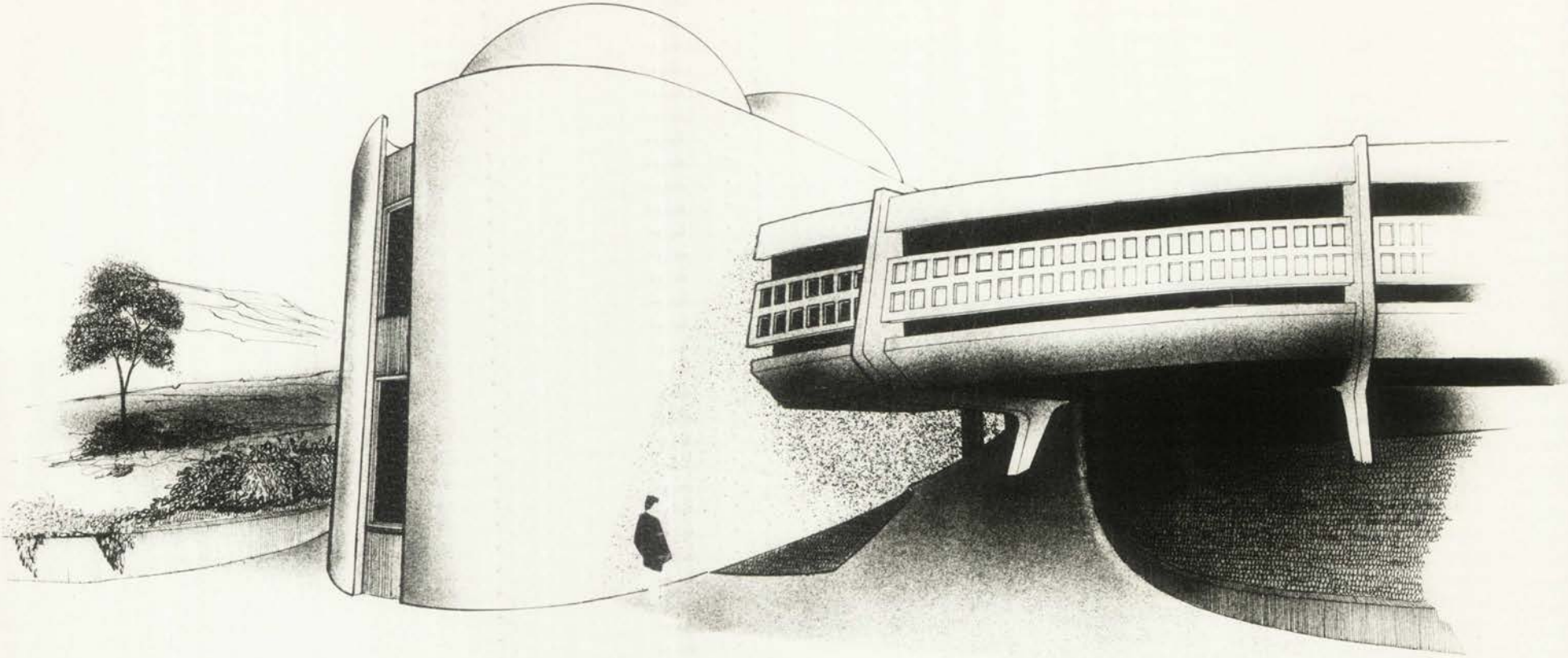

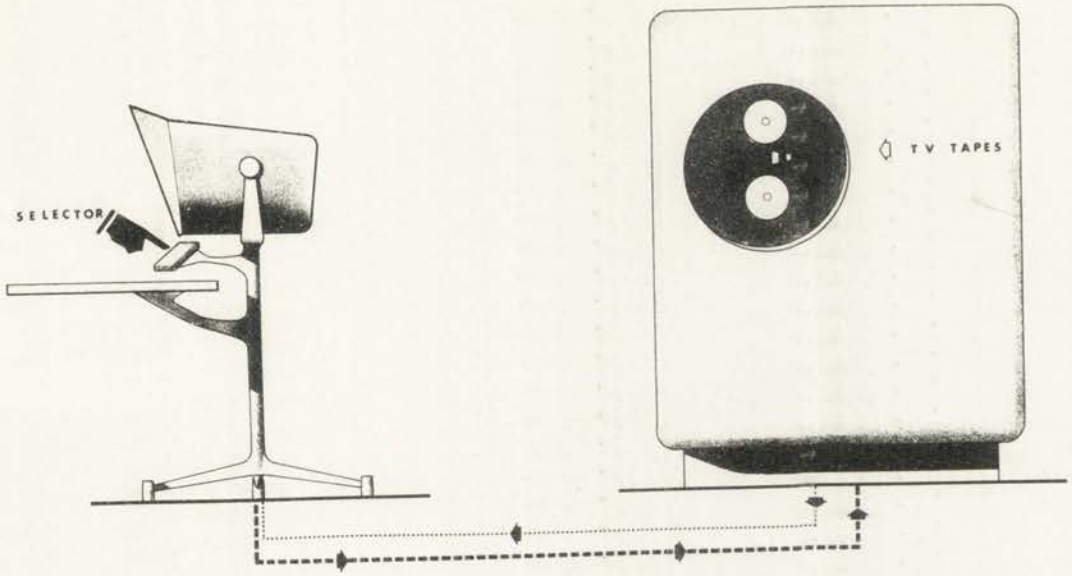

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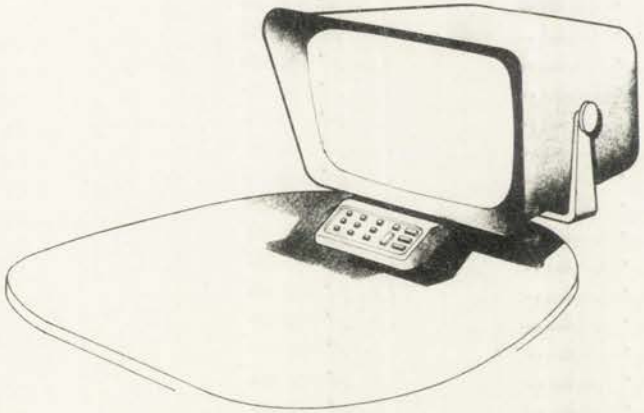

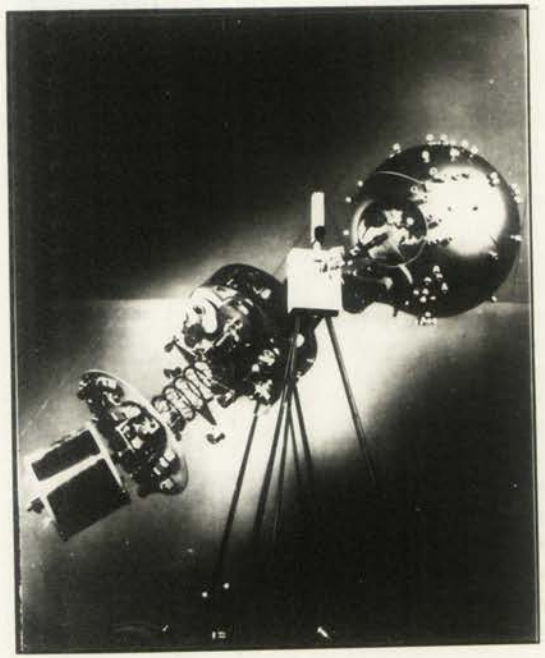

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