PROGRAMMING AS IT RELATES

EDUCATION OF ADULTS IN THE COMMUNITY

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

Maurice G. Moore

1965

This is to certify that the

thesis entitled

AN ANALYSIS AND EVALUATION OF PLANETARIUM PROGRAMMING AS IT RELATES TO THE SCIENCE EDUCATION OF ADULTS IN THE COMMUNITY

presented by

Maurice G. Moore

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Administration & Higher Education

Harold J. Dillon
Major professor

Date 8/18/65

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# AN ANALYSIS AND EVALUATION OF PLANETARIUM PROGRAMMING AS IT RELATES TO THE SCIENCE EDUCATION OF ADULTS IN THE COMMUNITY

By

Maurice G. Moore

AN ABSTRACT OF A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

College of Education

1965

ABSTRACT

# AN ANALYSIS AND EVALUATION OF PLANETARIUM PROGRAMMING AS IT RELATES TO THE SCIENCE EDUCATION OF ADULTS IN THE COMMUNITY

by Maurice G. Moore

This study was concerned with the discovery of differences that existed between adults in a community who attended planetarium programs and adults in a community who did not. The measurement of these differences was confined to aspects of media participation, attitude differences, and vocabulary recognition. The study was designed so that the discovery and measurement of these differences would provide the planetarium programmer, not only with a more adequate means of identifying the participating adult, but also with some method of measuring the effectiveness of current programming in a community where a major planetarium functions as an agent for dispersement of astronomical and related sciences.

The total population for the study was randomly selected from a comprehensive list of adult education classes offered by the Mott Adult Education Program of the Flint Board of Education.

Population of [illegible] .05 %

A total of one hundred seven adults enrolled in eight classes responded to a twelve-item inventory sheet designed to reflect the data necessary for the study. This total population was then divided into two sub-groups, attending and non-attending adults, and a comparison of the two groups was

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made in accordance with the objectives of the study. The analysis of the data in each of the two sub-groups varied slightly due to omitted or illegible responses on the part of the respondent.

The findings revealed that the two groups were quite dissimilar in their media habits. Adults who do not attend planetariums tend to read more books than do those who do attend but they do not read newspapers as often. Although adults who attend planetarium programs also attend more movies, they spend significantly less time watching television. The findings also revealed that those adults who did not attend planetarium programs spent more time per week listening to radio broadcasts than do those who do attend the programs.

From the data collected from the inventory sheet it was possible to determine that the attitude the adult holds concerning space research expenditures, although influenced by factors such as age, is influenced even more, greater than the one per cent level of confidence, by his attendance at planetarium programs.

The findings also indicated that multiple exposure of the adult to planetarium programs made a highly significant difference in the number of words recognized from a specialized glossary of space terms. When the multiple attending adult was compared to the single attending adult it was found that a level of confidence greater than 99.9 per cent existed in favor of the frequent attender of planetarium programs.

This study represents an effort to identify and measure with care a segment of the adult community where a planetarium functions as a popular interpreter of a specialized body of knowledge. It is hoped that additional studies will eventually produce a body of knowledge which will give the planetarium educator a clearer picture of the people with whom he works. Only when this picture has been completed, through additional research, will the planetarium director be able to improve programming in order to meet the needs of the adult in contemporary society.

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## ACKNOWLEDGEMENTS

The writer wishes to express his gratitude and appreciation to Dr. Harold J. Dillon, Chairman of his Guidance Committee, for his encouragement and guidance during the planning of this study and preparation of this thesis. Appreciation is also extended to the other members of the Guidance Committee: Dr. Clyde M. Campbell, Dr. David C. Ralph and Dr. Lawrence Battistini who provided the conceptual and organizational insights necessary for the completion of the project.

The author wishes to acknowledge his special indebtedness to Dr. Myrtle Black who made the resources of the Mott Adult Education Program available to the writer. Also, special mention must be made of the area coordinators and classroom teachers who so capably assisted in the distribution and collection of the questionnaires from which the data of this study were derived.

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# CHAPTER I

## THE SEARCH FOR ORDER IN MODEL

### Introduction:

Those who erroneously label "the space age" as being born during October of 1957 are incorrect by approximately one hundred million years. It is far more realistic to assume that the age of space and the age of man commemorated their advent simultaneously. Perhaps it would be wiser for us, in attempting to apply an historical label, to separate eras by employing the terms consideration and conquest. It is true that we might correctly position the age of conquest in 1957, but it is equally true that the age of consideration must be linked unequivicoably with the age of reason. Etymologically speaking, it is interesting to note that the word "consider," meaning to reflect upon, has its foundation in the word constellation since so much of man's early thought concerned itself with the discovery of his immediate and ultimate position in his universe.

There is a natural desire among men to bring order to that which is seemingly without order and to give form to that which is apparently formless. The reasons this desire lay fallow for so many centuries was that superimposed over the desire was the belief that the great celestial sphere was the spawning ground of the supernatural. Ordering for the sake of understanding was impossible in such an environment.

The pragmatic studies of celestial motion by the Egyptians and the Babylonians were soon to be wedded to the philosophic inquiries of the Greeks. This wedding, plus the gradual decay of the stellar god system, was responsible for producing, first of all, the celestial sphere, and secondly, the planetarium as we now conceive of it. Both devices were instituted to produce an ordered awareness in a great universal schematic.

Helmut Werner has written, perhaps, the only complete historical treatment of this quest for understanding as it pertains to the development of the visible universe model. Werner speculates that the first celestial globe was probably constructed by Anaximander in the sixth century B.C., but this speculation is based entirely on the fact that it was Anaximander who first expounded the spherical nature of the universe.[1]

If we define the word "planetarium" as it is defined in <u>Webster's New World Dictionary</u>, then we must assume that in order for a model to be rightly considered a planetarium the relative motions of selected celestial objects must be portrayed. The latter part of Webster's definition of the word,

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1. Helmut Werner, <u>From the Aratus Globe to the Zeiss Planetarium</u>, trans. A. H. Degenhardt (Stuttgart, 1957), P. 14.

". . .the relative motion of the planets around the sun. . ," must be purposely ignored since the heliocentric system was not widely accepted until sometime after the publication of the Copernican book dealing with celestial motion.

The first evidence we have of a model capable of demonstrating such motion indicates that it was designed by Archemedes in the second century B.C. Sulpicius Gallus' communication with Cicero tells us that such an instrument was taken from Syracuse in 212 B.C. and ultimately carried to Rome where it was placed in The Temple of Virtue.[2] Whether it was the original designed by Archemedes himself, as Dr. King reported to the annual general meeting of the British Astronomical Association in 1960,[3] that was so honored, or whether it was simply a copy of the original, as Werner[4] supposes, there can be no question as to the authenticity of its existence. It was through the genius of Archemedes then that the world was supplied with its first tangible model of order in celestial motion.

The Great Departure:

The weakness of all planetariums prior to the seventeenth century was that they, of necessity, reversed the position of stellar god and man. Man was able to view the constellations

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2. Cicero, De Republica, Book 1, Ch. XIV.

3. H. C. King, "Presidential Address, The Journal of the British Astronomical Association, Vol. 70, No. 1, (Jan. 1960), p. 8

4. Werner, op. cit., pp. 18-19.

superimposed on the stellar sphere only as they would appear to some infinite being occupying an unknown position within an infinite universe. At no time prior to the seventeenth century did the achievements of man allow him to see his universe from the position of the terrestrial bound creature that he was.

During the years 1644 to 1664, Andreas Busch, at the order of Duke Frederick III of Holstein, occupied himself with the construction of a hollow copper sphere weighing over three tons. The inside of the sphere was decorated with numerous stars and constellations. And, more to the point of departure, a bench seating ten people was held stationary within the hollow casing while the outer sphere was allowed to rotate about the observer.[5]

The quest for order was to reach its epitome in Germany in the twentieth century. Whether the credit for the development of the Zeiss optical planetarium belongs to Max Wolf who suggested the possibility of such an instrument, Oskar von Miller who approached the Carl Zeiss Company with the idea, or Walther Bauersfeld who eventually brought fruition to the proposal, depends, it is supposed, on whether one conceives of a splash to be the pebble or the ripple it produces.

Professor A. E. H. Bleksley of the University of Witwatersrand in Johannesburg, South Africa, said in his dedication book:

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5. For a complete description of the Gottorp Globe, see Werner, op.cit., pp. 20-21.

> The idea of building a large example of the rotating globe type was considered, but the solution finally came when Professor Walther Bauersfeld, in a sudden flash of genius, saw that it was possible to invert the problem.
>
> Instead of reproducing the sky by means of a large hollow sphere rotated about a fixed axis, as had always been done in the past, Bauersfeld suggested transfering the entire mechanism for the movement of heavenly bodies to a central projector, which would throw images of the stars and planets onto the inner surface of a fixed dome in the form of a large hemisphere.[6]

In the month of August, 1923, the special genius of one man and the accumulated genius of all men was demonstrated on the roof top of the Carl Zeiss Works in Jena, Germany. For the first time it was demonstrated that the visible universe could be adequately and correctly reproduced inside a sphere only forty feet in diameter.

<u>The Development of Major Planetariums in the United States:</u>

Seven short years after the "miracle of Jena" was introduced, a similar model was shipped to the United States of America where hundreds of thousands of people crowded through the doors of the Adler Planetarium in Chicago, Illinois, in order to see for themselves how it was possible to recreate the visible universe with such incredible accuracy within the comfortable confines of the inner chamber.

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6. A. E. H. Bleksley, <u>The Planetarium</u>, (Johannesburg, Africa: Swan Press Limited, 1959), p. 4.

Max Adler, a prominent Chicago industrialist, explained his gift to the people of Chicago like this: "The popular conception of the universe is too meager and the planets and the stars are too far removed from general knowledge."[7]

The decade of the thirties was a popular one for the installation of planetaria in this country. On November 6, 1933, the Fels Planetarium of the Franklin Institute was dedicated in the beautiful and historic city of Philadelphia. In the spring of the following year the people of California had their first opportunity to view the wonder of the simulated universe when Colonel Griffith J. Griffith of Los Angeles presented the third of the major planetaria of this country to the people of Los Angeles, while less than six months later, Charles Hayden of New York donated the Hayden Planetarium to the American Museum of Natural History in New York City.

Hayden's interest in popularizing astronomy was equally as intense as Adler's, but its expression took quite a different form:

> "I believe the planetarium is not only a place of interest and instruction, but that it should give a more lively and sincere appreciation of the magnitude of the universe and of the belief that there must be a very much greater power than man responsible for the wonderful things which are daily occuring in the universe."[8]

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7. Rhoda M. Musfeldt, staff writer, Chicago Park District, "Adler Planetarium and Astronomical Museum," <u>Illinois Parks</u>, January-February, 1962.

8. <u>American Museum - Hayden Planetarium</u>, published by American <u>Museum of Natural History</u>, Rev. Ed. 1961.

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THE MOON,

As the decade of the thirties closed, its conclusion was marked noticeably by the dedication of the Buhl Planetarium and Institute of Popular Science in Pittsburgh, Pennsylvania. The Buhl Planetarium became the fifth of the major installations operating in this country, and represented an institutional number that was not to be doubled for the next thirty years.

The decade of the forties, although far from quiet for the nation and the world, was somewhat hushed for the world of popular astronomy for, and for a myriad of obvious reasons, only one new major planetarium was dedicated during this period.

Although the avowed principal purpose of the planetarium was one of education, it is interesting to note that until 1949 no planetarium had been established as an adjunct to an existing educational institution. John Motley Morehead who, as a result of a conversation with Dr. Harlow Shapley, decided to donate a Zeiss Planetarium and science museum to the University of North Carolina. The decision stands as a far-sighted recognition of the importance space study and related sciences would some day play in the university curriculum. The decision also represented the last of the major planetariums of this country to install the Zeiss equipment as its original equipment.[9]

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9. Billy Arthur, "Please Fasten Seat Belt, next stop THE MOON," Tarheel Wheels, Feb. 1958, Vol. XV, No. 2, p. 5.

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In 1952 the Alexander F. Morrison Planetarium was dedicated to serve as a functional part of the California Academy of Sciences. The planetarium instrument itself was a "home-made" one, prepared in the Academy's own highly complex workshops. Dr. King describes the instrument as one of the finest mechanical achievements of the present age.[10]

New planetariums were also opened in the United States during the year 1958. The first was the Robert T. Longway Planetarium of Flint, Michigan. The equipment installed in this planetarium was manufactured by Spitz Laboratories of Yorklyn, Delaware, and although not the first major instrument completed by the Spitz Company, it was, nevertheless, the first such installation of major equipment in the United States.[11] The second inportant dedication during the same year occurred in Boston. The Charles Hayden Planetarium, not to be confused with Hayden of New York City, was designed by F. D. Korkosz and J. J. Korkosz, two brothers who turned their highly creative genius to the production of a revolutionary portrayal of the universe in motion.[12]

During the year 1959 the United States Air Force Academy in Colorado Springs unveiled the second of the Spitz Model

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10. King, <u>op. cit</u>., p. 18.

11. Maurice Gene Moore, "The Longway Planetarium in Flint, Michigan," <u>Sky and Telescope</u>, Vol. XVII. (August, 1958), pp. 500-501.

12. John Patterson, "Boston's Planetarium Opens," <u>Sky and Telescope</u>, Vol. XXV, No. 6. (June, 1963), pp. 316-320.

B instruments to be installed in this country. Although the instrument designated for the United States Air Force Academy was completed by the Spitz Laboratories prior to the Flint instrument, its actual dedication did not take place until 1959. At the time of their installation both instruments were basically the same, however, the Air Force planetarium was almost immediately modified to make use of a multiple incandescent light source as opposed to the zirconium source employed by the Flint instrument.

The last of the major planetariums was opened in St. Louis, Missouri, on the evening of April 16, 1963. It represents several unique departures from the commonly accepted planetarium concept both from an architectural standpoint and an instrumentation standpoint. Originally the architect, Gyo Obata, had designed the outer surface of the inner dome to represent the surface of the moon, somewhat reminiscent of the celestial globes of antiquity. This highly unusual proposal was only partially modified in the final building plans. Also, a further departure is represented by virtue of the fact that this is the first time the Goto Optical Company of Tokyo has reached the major popular astronomical market of the United States.[13]

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13. Charles A. Schweighauser, "New Skies for St. Louis," Sky and Telescope, Vol. XXV, No. 6, (June, 1963), pp. 316-320.

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Historically, then, we may summarize the important steps in the progression of man's search for order through model as follows:

<u>Sixth Century B.C.</u> -- Anaximander becomes convinced of the spherical nature of the heavens and probably constructs the first celestial globe.

<u>Fourth Century B.C.</u> -- The Atlante Farnesiano was sculpted by an unknown artist. The model shows forty-two relief constellations.

<u>Third Century B.C.</u> -- Aratus wrote a poem called "Phenomona." The poem was written to explain earlier writings by Eudoxus, but it had itself to be explained by the production of several Aratus Globes.

<u>Third Century B.C.</u> -- Archimedes constructed the first model based on the geocentric system of Eudoxus.

<u>Second Century A.D.</u> -- Claudius Ptolemy improved the celestial globe without changing the geocentric orientation of Eudoxus.

<u>Sixteenth Century A.D.</u> -- Copernicus published <u>De Revolionibus Orbium Coelestium</u>, establishing the heliocentric position and thereby reversing the causes for motion.

<u>Seventeenth Century A.D.</u> -- Olearius, court mathematician of Duke Frederick of Holstein-Gottorp, suggested the construction of a hollow copper sphere by Andreas Busch of Limberg. The globe was designed to be viewed from the inside rather than from the outside.

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Seventeenth Century A.D. -- Johannes von Ceulen of the Hague built a planetarium from designs created by Christian Huygens.

Eighteenth Century A.D. -- George Graham of the Royal Observatory Greenwich produced a model for Charles Boyle, the fourth Earl of Orrery.

Nineteenth Century A.D. -- The largest Gottorp type planetarium was designed by Roger Long, professor of astronomy at Cambridge.

Twentieth Century A.D. -- Walther Bauersfeld of Zeiss Works in Germany designed the first planetarium with a fixed sphere and a movable projector.

It must be realized, of course, that the historical summary here is only a summary of the important changes taking place in man's quest for understanding the order of his universe. The blank centuries are not meant to imply a complete lack of interest of investigation. Each step, every modification, however small, was designed to move the knowledge of astronomy forward to a position where scientists like Robert Baker could say "Planetariums in increasing numbers in various parts of the country and abroad offer impressive views of the heavens and the movements of celestial bodies. They show replicas of the skies more clearly than many city dwellers are likely to see the real sky. By speeding up the celestial movements they make these motions easier to see and to compr

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to comprehend."[14] The brief historical summary of the progression also demonstrates quite clearly that man, as a reasoning animal, has always had the desire to relate himself through knowledge to those things that pose a serious challenge to his intellect. It may be said, at least for many, that the planetarium is the impetus leading to studious scientific inquiry. John Duncan, when writing to this particular point said, "The use of planetaria is extensively promoting interest in astronomy and the understanding of simple facts concerning the heavens."[15] We may assume that if the planetarium does no more than this, arousing the interest of the citizens within the area it serves, it will have performed a significant social function.

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14. Baker, Robert H., An Introduction to Astronomy, (Princeton, New Jersey: D. Van Nostrand Co., Inc., 1958), p. 325.

15. Duncan, John Charles, Astronomy, (New York: Harper & Brothers Publishers, 1954), p. 30.

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## CHAPTER II

## THE NEED FOR ASTRONOMICAL EDUCATION IN THE SPACE ORIENTED SOCIETY

Each society has paradoxically been both the creator and the victim of its own creations whether these creations took the form of mishapen gods, conquering armies, or inquiring philosophers, they disturbed the existing balance of the social order in which they occurred.

Man of the latter half of the twentieth century has lived almost continuously in a kind of social imbalance brought about by his rapid advancement in the areas of science and technology. His creations enabled him to look more closely into his fellow man, thereby discovering the secrets of his own illness and his own decay. His creations have enabled him to probe the depths of his own planet, and, in an opposite direction, his creations have enabled him to be more fully aware of the infinitesimal nature of his universe and the minute and finite position he occupies within it. No longer are we able to say with absolute surety, as John Sternig said in 1949, that the average inhabitant of our planet is still just as earth centered in his mental outlook as though Copernicus had never been born.[1]

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1. John Sternig, "Astronomy." Science Education, Vol. XXXIII, (October, 1949), p. 277.

There are, to be sure, thousands of individuals who still cling to outmoded beliefs, individuals to whom change is uncomfortable because it threatens to destroy old concepts that have become emotionalized through habit and association. We may generalize that most of these misfits of our age are such because they have not acquired the necessary facts to alter their perspectives, but we must also realize that of this number there is a smaller group who, although perhaps not admitting it even to themselves, cling to the inviolate sanctity of space and all objects to be found there. Such an attitude was reflected in The Flint Journal recently in a column devoted to the views of its readers. The writer, a Mr. Harry E. Goding, said, "More and more of us see it (a landing on the moon) as the nonsensical thing that it really is. God gave us earth on which to dwell and we should be satisfied not to invade the universe."[2]

A. H. Maslow recognized the enormity of the task our institutions confront in attempting to fit all men into the requirements of the age. "Our great task (now)," Maslow wrote, "is to bring man in scale again with the entire horizon of nature, so that he can sense it in all its wealth and promises, harmonies and mysteries. In ignorance and pride and by insecurity, we have severed ourselves from our broader background."[3]

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2. The Flint Journal, "In Your Opinion," January 14, 1964.

3. Abraham Harold Maslow, New Knowledge in Human Values, (New York: Harper and Brothers, 1959), p. 91.

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Although popular dissemination of scientific information has failed thus far to provide all our citizens with the understandings necessary to associate themselves meaningfully to this broader background of nature, or to accept as their own the values of our space research; nevertheless, preparations for extra-terrestrial explorations have continued at an ever-increasing tempo. In 1962 the National Aeronautics and Space Administration distributed 119.8 million dollars of federal funds for the purpose of advancing space research. By 1963 the budget had increased to 174.2 million dollars and an estimated budget for 1964 shows a total expenditure of 232.6 million dollars, or almost double the amount spent in 1962.[4] Unless there is a drastic reversal of government policy it seems highly probable that national expenditures will continue to increase as our scientists continue to probe deeper into the secrets of the universe.

Such a reversal of government policy seems unlikely in light of the position taken by our national leaders. The late President John F. Kennedy, speaking at Rice University on September 18, 1962, said, "The United States means to become the world's leading spacefaring nation. We sail on this new sea because there is new knowledge to be gained and

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4. Material taken from a report to the American Association of Physics Teachers, University of Maine, June 28, 1963. See NASA publication, NASA EP-12, page 11.

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new rights to be won and they must be won and used for the progress of all people."[5] In 1964, President Johnson affirmed his intention to carry out the Kennedy Space Program to the best of his ability.

Perhaps the official government position, both for the present and the future, has been summed up best by James C. Webb, NASA administrator, in these words:

> The resources of Government, industry, and education have been mobilized to achieve our goals in space. Rapid progress is being made in the development of advanced launch vehicles and spacecraft, in the establishment of essential facilities and in organizing the scientific and technological support required in the great pioneering endeavor.
>
> We must learn about space because knowledge begets progress and new and better ways of life for all mankind. Just as past investments in scientific research and technological development are largely responsible for the comfort and convenience of life today, so will our space dollars contribute to the improvement of our lives tomorrow.
>
> Scientific and technological prowess is achieving increasing recognition throughout the world as a social, economic and political force. Our position as leader of the Free World requires that we continue to demonstrate our leadership in this field, in space, as well as on the earth.[6]

The problem of disseminating scientific knowledge to the broadest possible population base is important for still

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5. NASA, "Historical Origins of the National Aeronautics and Space Administration," U. S. Government Printing Office, Document 686-672, page 16.

6. NASA, "1-2-3 and the Moon," U. S. Government Printing Office, Document EP-7, pp. 28-29.

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another reason. If the vast majority of the citizens of this country are to accept, understand and support the objectives of space exploration, then every effort must be made to humanize both the science and the scientist who practice it. Accepting, understanding, and supporting are all conditions more easily attained if a correct interpersonal identification can be established. Slabaugh and Butler define physical science as a process as well as a body of knowledge. "This process," they continue, "known as the scientific method, involves making observations under controlled conditions with an attitude of impartiality and open-mindedness."[7] Contrast this cold, impersonal definition with the definition given by Warren Weaver, Vice-president of The Alfred P. Sloan Foundation. "Science is an adventure of the human spirit. It is essentially an artistic enterprise, stimulated by curiosity, served largely by disciplined imagination and based largely on faith in the reasonableness, order and beauty of the universe in which man is a part."[8]

Americans are confronted with two possible courses of action here in the latter half of the twentieth century. Either they can develop an adequate understanding of the objectives and requirements of the age and thus become partners

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7. Slabaugh, Wendell H. and Butler, Alfred B. College Physical Science, 2nd edition, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959), page 2.

8. Weaver, Warren. "Science," Think Magazine, December, 1960, page 15.

in a great adventure, or they can function with inadequate knowledge and become nothing more than oilers and stokers of a costly government research machine. If the former of these two alternatives is chosen then it must become the obligation of each dispersing medium of scientific knowledge not only to reach the maximum number of citizens but to translate all available information in such a manner that it reflects both the realized truth and the future challenge.

Astronomy at the Primary and Secondary Levels of Education:

There are numerous stories circulating now about youngsters at elementary levels in our school systems who are conversant with such things as propulsion theories and angles of injection, and who, due to their ages and the nature of the system, must sit quietly while their teachers expound on elementary multiplication and addition. Today's children find the world of the teacher to be slightly tainted with the musk of the dinosaur and today's teachers, all too often, regard their pupils as creatures from some unknown, undiscovered planet. Yet the principal difference between the two groups is that where one has been born to the vastness of some universal perception, the other has had to be adopted into it. Perhaps it was a premonition of the problems to rise out of education's struggle with astronomy and space sciences that prompted Professor George S. Counts to remark:

> The schools lag far behind the march of events. Although the service they render in their present form is indespensible

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> to the functioning of our society, they fall well below the requirements of the age.[9]

The school systems of our country have many of the same characteristics as people. Perhaps this can best be explained by saying that school systems are almost perfect reflections of the communities they serve. The sociologist who researches the community finds that it tends to become more conservative in its approach as the area under consideration is reduced. The educationalist researching the primary and secondary levels finds much the same attitude reflected in that conservatism "at home" is an invisible community force operating against change in the school system. To prove this point quickly one need only go back a few years and review the profusion of emotional outbursts against a principle of change called consolidation.

It is unfortunate, perhaps, that public education did not study medicine's great move to strengthen preventive health measures in the latter part of the forties. If they had, perhaps the crisis of the fifties would have been either minimized or avoided completely. The fact that we were far outdistanced by the Soviets from 1957 through 1960 was probably no more due to the failure of the schools than to the failure of society in general. Yet, education had been entrusted, in an implied fashion, with preservation of the

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9. Counts, George S. Education and American Civilization, (New York: Teacher's College, Columbia University, 1952), page 201.

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common defense. "The soft-pedagogy," wrote Carleton Washburne, "of our whole educational system from kindergarten to university got blamed for not having given enough emphasis to science and mathematics to enable us to shoot bigger and better rockets into space."[10]

Although a great public complaint was directed against our teaching, or lack of it, in the areas of science and mathematics in the Fall of 1957, and although educators at all levels were subject to criticism by men like Admiral Rickover, it is important to notice that even these torrents of criticism had little immediate effect upon the modification of the curriculum. From June 15, 1959, to July 10, 1959, the National Science Foundation conducted a neglect survey in St. Cloud, Minnesota. The findings of this survey indicated that the most neglected sciences were geology, foundation of the earth sciences and astronomy, foundation of the space sciences.[11]

One cannot place the responsibility for this lack of adaptability on commercial companies marketing printed classroom materials. A simple survey of new elementary science texts indicates that publishers are devoting an ever-increasing amount of space to the study of earth and space sciences.

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10. Washburne, Carleton. "An Eighty Year Perspective on Education," Phi Delta Kappan, Vol. XLV (December, 1963), page 150.

11. Price, Roger W. "Improvement of Astronomy Education (K-16) through a State-Wide Program," published by St. Cloud College, Vol. 15, No. 4, (January, 1960), page 4.

Likewise, at the secondary level, the new approach to physics, as developed by the National Science Foundation, concentrates an adequate amount of attention on the discovery of physical law as it relates to the area of astronomy.

In order to explain the failure to institute courses of study in astronomy, one need look no further than the professional preparation of the nation's teachers. The colleges and universities, particularly in the preparation of the 800,000 elementary teachers, have woefully failed to provide these teachers with the means of answering the questions of young, inquiring minds. The Spitz Laboratories published a book in 1960 that included the following suggestions as possible units of study for K-12: The Earth as an Astronomical Object, Reasons for the Seasons, Latitude and Longitude, Time and Place, The Earth's Atmosphere, The Sun and Its Energy, Sunspots and Prominences, The Sun's Family, The Moon, The Stars, The Galaxy, Nebulae, Extragalactic Structure, Constellations, and Instruments.[12]

The simple fact is that these suggested units are important to our young people if they are to develop the understandings necessary to relate to their age but conversations with any group of teachers would quickly reveal that there

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12. Early, Roger Neil. The Use of the Planetarium in the Teaching of Earth and Space Science, (Yorklyn, Deleware: Spitz Laboratories, Inc., 1960).

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is just not enough specialized training in this area to enable them to transmit this kind of information. What the teacher does not understand well certainly cannot be transmitted through educational processes.

It would seem that once again we are faced with two alternate courses of action. Either we must find some effective means of teaching astronomy and related earth and space sciences during the primary and secondary years or we must postpone such education until the student has registered for college and university work. In light of world conditions, and in consideration with known facts, the latter alternative would seem inadvisable. In government publication SPE 63-C-3a the following statement appears: "The National Science Foundation recognizes that careers in science engineering and mathematics may often be started in the elementary schools and that later professional work depends upon the groundwork of the earlier years in school."[13] A similar position regarding the importance of this early training was taken by the American Astronomical Society. "A survey of the members of the American Astronomical Society showed that sixty per cent developed their interest in astronomy before they entered college . . . It is thus to the advantage of

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13. Government Publication SPE 63-C-3a, "Suggestions and Forms for Preparing a Proposal for a Summer Institute for 1964." Published July, 1963, page 1.

the student and the science if his or her interest and abilities are discovered and nurtured while he is young."[14]

Astronomy and Higher Education:

A study of astronomy in higher education would seem at first glance to indicate an adequate amount of attention to the propogation of the thirty-seven colleges and universities located in twenty-one different states offering work in astronomy at the undergraduate level. Twenty-six of these colleges offered the Doctor of Philosophy degree in astronomy in 1962.[15]

Even though the number of graduates in astronomy has been increasing, the demand for these graduates by industry has risen so sharply that university increases have not been great enough to keep the deficit in professionally trained astronomers from increasing.

Government concern with the space sciences is naturally pointed toward maximum industrial utilization of both personnel and the findings gathered from astronomical research. Therefore, most college graduates in this area have been siphoned off without ever having had the opportunity to acquaint the average citizen with his own specialized contributions to the wider field of complete scientific knowledge.

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14. Pamphlet, "A Career in Astronomy," Published by the American Astronomical Society, Revised in 1962.

14. Ibid., "A Career in Astronomy."

The consequential development of knowledge as a result of interaction between government and industry on the program and product of the universities has resulted in astronomy as a body of knowledge taking the form of an extended rectangle resting on its lesser side and increasing the length of the greater without appreciably increasing the width of its base. One can easily infer this structure of astronomical knowledge from the objectives of the National Aeronautics and Space Administration as they were presented by John T. Halloway in the Summer of 1963:

> In the Summer of 1961, with the President's decision to accelerate the national space effort and accomplish a manual lunar landing before the end of this decade, consideration was given to what steps NASA could take to increase materially the universities' contribution to the accomplishment of our total mission. Several principal goals emerged from some rather careful studies:
>
> (1) An increase in the production rate of highly trained people.
>
> (2) More adequate laboratory facilities in which to conduct research to support NASA's mission.
>
> (3) Removal of interdisciplinary barriers in research and fostering of genuine cooperation between workers in collateral fields.
>
> (4) An increased awareness by universities of their national responsibilities in the attainment of national goals.
>
> (5) Application by universities of their unique and extensive talents to an understanding of the interrelationship of space research and technology,

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> academic processes, industry, commerce, and society in general.[16]

Astronomy and Adult Education:

> There is no escape from the urgency of providing high-grade and plentiful adult education in science. Major national decisions are being made now which affect our scientific efforts; these decisions will be made without the participation of our people if the citizenry does not understand scientific matters. Furthermore, major scientific and engineering achievements can be counted upon to raise, as they have already serious social and international problems which will need the attention of an enlightened citizenry. Science must be made interesting and challenging to the non-scientist and all means at the popularizer's command -- TV, radio, the press, films, museums -- must be used effectively for adult education in science.[17]

The above statement by Robert Briber, formerly technical assistant to the Panel on Science and Engineering Education of the President's Science Advisory Committee, summarizes quite concisely the importance of widely distributed science information to the adults of our country.

We can no longer afford to keep any area of specialized knowledge closeted in the towers of a university, especially when that knowledge can and does affect every adult of every community so directly. The argument that we should leave decisions concerning the further utilization of space to the

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16. Op. cit., NASA, EP-12, pp. 60-61.

17. Briber, Robert M. "Education for the Age of Science," Phi Delta Kappan, (October, 1959), Vol. XLI, page 3.

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academicians and the technologists is, of course, partially correct. Yet, in such an attitude, in the desire to be undisturbed by the march of science, lies a danger that threatens to destroy, not only the individual but the very basis of the society he has formed. When a science such as astronomy becomes an adjunct of government, as it has, we can no more afford to be uninformed as to its progress than we can to be uninformed as to the qualifications of a candidate seeking political office. If the adults of our nation do not use every available means of informing themselves as to this progress then they are allowing themselves to be taxed without representation. It is not a luxury to be an informed adult in this society. It is a vital necessity which may well determine our national survival.

Scope and Limitations:

Due to the tremendous increase in the number of planetariums as institutions charged with the distinct obligation of interpreting the science of astronomy and related sciences to the community, it was felt that a study should be made to analyze and evaluate planetarium programming as it relates specifically to the science education of a community. Since it would have been impossible to analyze all of the distinct programming elements of over two hundred such institutions now functioning within the United States of America, it was decided that only the eleven institutions designated as major planetariums should be subjected to analysis and that the study should concentrate only upon those points of similarity in the programming structure rather than attempting to specify their many and important differences.

The analysis of these similarities revealed that each planetarium, regardless of specific defferences in programming, had to concern itself with the following basic elements in order to develop a program of successful service to the scientific and technologically oriented society in which it functions:

1. Preparation of material content
    a. relationship between the program context and the limitations imposed by the science
    b. relationship between the context and the basic instrumentation and its supporting auxilaries
2. Attracting and holding an audience
    a. the role of the public image in continuing community support
    b. the role of radio advertising in the solicitation of public support
    c. the role of television advertising in the solicitation of public support
    d. the role of newspaper advertising in the solicitation of public support
3. Narrating the program
    a. acquainting the lecturer with his materials

b. acquainting the lecturer with the unique requirements of the medium

The absence of any qualitative research in the area of planetarium programming, when combined with the understanding that the responsibility of the institution is to serve the total community, seemed to preclude the possibility of narrowing the scope of the investigation. Rather, the nature of planetarium programming was perceived to be of such a nature as to recognize no artificially erected gradations. For the purpose of this study, then, astronomical education was viewed as a continuing process, extending from the elementary schools through the post-professional period of life.

Since a complete analysis of the effectiveness of science education through effective planetarium programming seemed impossible to complete, it was decided to limit the investigation to a few selected problems that are applicable to the general success of the institution as it strives to realize its objectives. The problems selected for investigation were as follows:

1. Is planetarium instruction capable of producing better learning among students and adults than is the conventional classroom situation?
2. Is the impact of the planetarium experience such as to produce a noticeable change in attitude toward the area of astronomical science?
3. Can predictions be made as to the type of adult

most likely to avail himself of special instruction in the area of astronomy?

4. Is planetarium programming providing the informational needs of the adult in today's society?

At first, even the limitation of the investigation to these five basic questions seemed too broad in scope to be answered in a single investigation. However, in actual practice and experimental design it was found to be possible to provide satisfactory answers to these questions by initiating only three separate research projects, each of which plays an important role in the determination of the effectiveness of planetarium programming.

In designing research that would provide answers to the first three questions to be answered in this study, several forms of statistical treatment were employed on the collected data. In each instance the non-experimental variables were controlled as closely as possible. There was one variable, however, within these particular investigations that was not controlled. That was the quality of the classroom teaching involved. The experiments were designed in each instance to control the amount of time devoted to the material, the nature of the material presented, but not the inherent quality of the presentation. The effect of this particular variable will have to be determined by subsequent investigations.

Two other possible limitations of this study should also be considered. The evaluation of the data from the investigation included in this study was limited due to the instruments used in the investigation. Further, since the investigations were made at different educational levels, it is doubtful that the results of the study can be generalized to populations within strata different than the one measured in the experimental situation.

The Hypothesis:

This thesis is an analysis of planetarium programming in order to determine:

1. the actual value of this type of science instruction as it relates to the areas the planetarium serves,
2. the actual value of the planetarium as it functions within the adult level of our society, and
3. the isolation of factors that will increase the general effectiveness of communications with the citizens of the community.

The general or collective hypothesis to be proved by this study is that planetarium programming, although apparently effective by virtue of the great numbers involved, can be improved by correctly identifying those areas of population in which the strongest potential planetarium support may be located.

## CHAPTER III

## EXISTING PROGRAMMING IN THE MAJOR PLANETARIUMS

Planetariums all have as a centralized objective, the teaching of astronomy, but the methods by which this objective is realized are as divergent as the personal philosophies of the men who serve on their governing bodies. Speaking to this divergency in programming, Dr. H. C. King said, "While some can keep closely to a schedule of formal lectures, others have to tell the story of astronomy through entertainment and a third group must resort to all sorts of optical tricks and expedients."[1] This statement implies an "either-or" approach which is probably somewhat misleading in light of the fact that all planetariums combine, at least to some degree, the three approaches mentioned by Dr. King. Without some element of these three possible approaches it would be impossible to generate an effective interest in the topic under consideration and, as Richard Weaver has said, "We do not undertake to reason about anything until we have been drawn to it by an effective interest."[2] Perhaps it would be more appropriate then to say that the ultimate objective

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1. Op.cit., King, page 19.

2. Weaver, Richard M. Ideas Have Consequences, (Chicago: University of Chicago Press, 1948), page 19.

of any planetarium programming is to generate reason based upon a stimulation of the interest.

<u>The K-12 Programming in Major Planetariums:</u>

From January 1, 1962, through December 31, 1962, a total of 5,791,192 youngsters representing all grades K-12 attended the ten major planetariums of the United States in order to become better acquainted with the science of astronomy.[3]

It should not, however, be assumed from the previous figures that all grade levels were equally represented in these educational programs. Customarily, instruction in the science of astronomy is postponed until the pupil has reached the fourth grade level. We may generalize to this observation by saying that the bulk of planetarium school attendance represented grades 4-12 rather than grades K-12. There does seem to be some trend toward moving instruction in very simple astronomy to a lower level as evidenced by the fact that each year the number of requests for special programs designed for grades one and two show notable increases. In part, we may assume that this this tendency is simply following the "push-down" "Beef-up" process prevalent at all levels of education, and, in part, it may be attributed to an attempt to create a kind of atmosphere of scientific

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3. Material from Director's Conference, May 20, 21, 1963. Figures include only organized school groups.

appreciation and readiness in which later and more advanced scientific studies might be couched.

Recently the United States Air Force Planetarium initiated the most comprehensive school program to be offered by any of the major planetariums. Each teacher in the Denver-Colorado Springs-Pueblo area is familiarized with two existing series. Series A is to be offered during the fall semester and Series B is to be offered during the spring semester. In order to present an accurate picture of the comprehensiveness of the program, let us consider only those programs listed as Series A.

Fall Semester -- Series A

Grade K:

"Zoo in the Sky"

Apparent (daily) motion of sun and moon
Twilight and the stars
Constellations of the Zodiac and the northern sky
Twilight, sunrise, and daylight

Grade 1-6 (Graded Lectures)

"The Sun - Our Star"

A solar furnace
Daily motion of the sun

"The Moon - Our Natural Satellite"

Features, characteristics, and distance
The month of phases
Length of a lunar day or night - as seen from the moon.
Earth shine on the lunar surface

"The Earth and Its Motion in Space"

Day and night - rotation
Reasons for the seasons - revolution

"The Solar System - Family of the Sun"

Terrestrial planets
Jovian planets
The dark planets
Direct and retrograde motion - the Copernican solar system
Gravity on the planets
Possibility of life in other planets
The planets are named - history of discovery
The mystery planet - Vulcan

"The Stars in the Sky"

Composition of the stars
Temperature, size and distance
Stellar motions
Differences between a star and a planet
Twinkling or scintillation
Stars in the Big Dipper
Why the stars are visible only at night
Constellations of the current evening sky

"Space and Travel"

A rocket trip to the moon
Can we live on the moon?
Travel time to our nearest star
Why is space dark?
Satellites in orbit around the earth

Grade 7-8:

"Aspects of the Sky"

Locating cellestrial objects
Identifying the constellations
Motions on the cellestial sphere

"The Earth in Motion"

Rotation of the earth on its axis
Revolution of the earth about the sun
Precession
The earth clock - time keeping and the seasons

"The Moon"

Origin and physical characteristics

Motions of the moon
The lunar surface
Eclipses and tides

"The Solar System"

Planets and their characteristics
Other members of the sun's family
Life on other planets
Origin of the solar system

In programming for pupils at the elementary, intermediate and secondary levels of education, there are two distinct points of departure. Some planetariums, such as the United States Air Force, present a series of graded lectures, carefully selected and controlled as to materials and vocabulary. Careful review of these programs will show that they are designed to be cumulative, building one layer of knowledge on another with the greatest complexities of pure and applied science occupying the apex of its pyrimidal structure. Other planetariums, notably Hayden of New York City and Adler of Chicago present only the public program in which the lecturer tries to adapt the material to the needs of the classroom and the interests of the pupils.

Due to the great differences existing among the institutions themselves it is impossible to list all of the activities for young people which lie outside the province of the classroom. Each year thousands of Boy Scouts and Girl Scouts study formal programs in astronomy in order that they might fulfill the requirements for receiving astronomy and star badges. Buhl Planetarium of Pittsburgh sponsors a highly successful summer course called the "Junior Space Academy" in which approximately six hundred boys and girls participate in science instruction at four separate levels of difficulty. In addition, during the Christmas vacation, Buhl conducts a School Science Congress in which students of junion and senior high levels present papers dealing with some aspect of original scientific inquiry.

It would be possible to go through the entire list of major planetariums and select numerous programs uniquely designed to serve the youth of the area in which the planetarium operates.

Planetarium Education and the College and University:

Only three of the major planetariums, as has been seen, are associated directly with colleges and universities. The Morehead Planetarium at Chapel Hill operates as part of the University of North Carolina. Longway Planetarium of Flint, Michigan, is classified as an adjunct of the Flint Community Junior College and The United States Air Force Academy Planetarium is part of the parent institution whose name it bears. Of these three college associated planetariums only the Longway Planetarium of Flint, Michigan, offers accredited courses in astronomy as a laboratory science with degrees granted by the parent institution. Courses offered in Flint are transferable, not only at the junior college level if offered by the community college, but also at the graduate level if offered by the Extension Service of The University of Michigan.

In spite of the fact that the majority of the planetariums in this country are not associated fiscally or administratively with institutions of higher education, most planetariums do conduct a lively program of college and university instruction and research. This instruction is not always related exclusively to the science of astronomy, but, rather, it is related to many different areas. Colleges may offer credit courses at planetariums in celestial navigation or geodetic survey. The "sky theater," as it is customarily called, may be used for biological studies dealing with the nocturnal migratory habits of birds or for psychological sensory experiments dealing with space and depth perspectives as they relate to a non-fixed reference. Once again, it needs to be pointed out that each planetarium is uniquely related to higher education in its own area, but common to all is the dedication to the extension of human knowledge, both vertically and horizontally among the people.

Adult Education and the Planetarium:

The position of the planetarium in the area of adult education has become increasingly important as man has, through the application of newly discovered principles, shortened the bridge that separates him from the rest of the universe. The need to understand imposes itself just as strongly in the life of the adult as it does in the life of the child. As Thomas D. Nicholson said, "The planetarium lecture occupies a rather unique position in an age in which television, radio and motion pictures dominate the competition for the recreational time of the American public.

Planetariums present what is probably the most popular successful and heavily attended lecture program in our country today."[4]

If one doubts as to whether the statement by Dr. Nicholson is correct, at least in so far as its quantative aspect is concerned, it is only necessary to glance at the figures representing attendance at public programs during the year 1962. Since the purpose of the public program can be considered to be one of adult education, and since the year 1962 showed a total attendance of 1,950,683 persons at the ten major planetariums, it seems fair to assume that the reference to the program as being the most heavily attended lecture program in this country is quite accurate.

The fact that approximately two million people attended public programs at institutions designated as a major planetarium does not mean that each person, assuming that he attends each public program, would receive instruction in astronomy equal either in quantity or quality to that received at some other major institution. In order that this difference may be apparent, let us select three of the eleven planetariums and trace their public show programming from September, 1962, to June, 1963.

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4. Nicholson, Thomas D. "The Planetarium Lecture," Curator, Volume II, No. 3, 1959. Page 269.

Buhl Planetarium -- Pittsburgh, Pennsylvania

September 1-4 . . . "Tomorrow's Target: The Moon"
September 5-6 . . . "Stars over Pittsburgh"
September 27 -
October 31 . . . . "The Sea and the Stars"
November 1 - 27 . . "Conquering New Horizons"
November 28 -
January 2 . . . . "Star of Bethlehem"
January 3 - 23. . . "Earth's Neighbors in Space"
January 24 -
February 19 . . . "Geography of the Moon"
March 1-19 . . . . "Legend of Stars"
March 20 -
April 15 . . . . "Easter - The Awakening"
April 16 - May 8 . "Tomorrow's Target: The Moon"
May 9 - June 19 . . "Weather in Action"

Charles Hayden Planetarium -- Boston, Massachusetts

September 1 - 30 . . "Skies and Storms"
October 1 -
December 2 . . . . "Man on the Moon"
December 4 -
January 6 . . . . "Annual Christmas Show"
January 8 -
March 31 . . . . . "Beyond the Moon"
April 2 - June 30 . "The Sun in Action"

Adler Planetarium -- Chicago, Illinois

September . . . . . "Wanders of the Sky"
October . . . . . . "Between the Planets"
November . . . . . . "Stars of Winter"
December . . . . . . "Star of Bethlehem"
January . . . . . . "The Nearest Star, Our Sun"
February . . . . . . "What are the Stars"
March . . . . . . . "Origin of the Stars"
April . . . . . . . "Stars in Motion"
May . . . . . . . . "Variable Stars"
June . . . . . . . . "Time and Navigation"

The three planetariums selected show three distinct philosophies in programming for adult education in astronomy. Both

Buhl and Charles Hayden are topic oriented while Adler is definitely subject oriented. A glance at the titles of the public presentations will demonstrate that the Adler Planetarium will concentrate more heavily on information than will either of the other two. Even though there is a surface similarity between the two topic oriented institutions, it is apparent that Buhl offers more programs outside the fundamental realm of astronomical science, than does Charles Hayden.

It is safe to assume from the material presented here that there can be no standard of quantity or quality derived that can be used as an effective yardstick to measure adult education on an inner-institutional basis.

Adult education takes many forms in planetarium programming. Some of the most interesting contacts the adult of a given community may have with science may not come with a blare of stereophonic trumpets or the glare of a thousand stars. Some programs offered by a planetarium may have little direct relationship to astronomy and may be justified only on the cause that the institution is well-known, well-respected and has acquired, usually over years of sorting success from failure, the reputation for being a reputable spokesman for the sciences.

In designing a program to give adults a better understanding usually involves a series of lectures by "experts" who are imported because of their publicized achievements.

It is true that each community should have such talent made available on occasion but it is equally true that any community can provide capable men and women who are more than willing to make available whatever specialized knowledge they might have accumulated.

The Robert T. Longway Planetarium initiated a "hometown" kind of approach in 1962 in a series of lectures called "Science and You." The series was held on Sunday afternoon and the voluntary attendance at each session fluctuated between seventy and eighty. Only community leaders, scientists and educators were asked to participate but the response to the series justified its inception. A list of topics and lecturers demonstrates the flexibility of the program.

"Violence and the Weather" -- A. E. Burgtorf, Meteorologist in Charge, U. S. Weather Bureau

"The Meteorologist at Work" -- A. E. Burgtorf

"What Kind of Day Will it Be?" -- Don Bradley, WJRT-TV, Flint, Michigan

"Exploring Below the Surface" -- Gerald Welsh, Department of Geology, Flint Junior Community College

"The Development of Man" -- Dr. Mona Meltzer, Flint Community Junior College, Department of Anatomy and Physiology

"Defense: Above and Beyond the Earth" -- Harry Carnaham, Public Relations, Bell Telephone Company

"Rockets into the Future" -- Leonard Batz, Senior Contact Engineer, A.C. Spark Plug Company, Flint, Michigan

"Gas Between the Stars" -- Dr. William Howard, Astronomy Department, The University of Michigan, Ann Arbor, Michigan

In considering the effect of planetarium programming, one must also take into consideration the popularity of non-credit courses designed primarily for the adults of the community to be served. The total number of 102,106 enrolled in special classes, institutes and workshops during the year 1962 fails to tell the complete story of planetarium education in this area. Dr. Kenneth L. Franklin, writing in Sky and Telescope Magazine had this to say of adult education and the planetarium:

> At planetariums, public attendance has increased, for people seek to experience the excitement and fascination of astronomy. Six years ago here at the American-Museum-Hayden Planetarium, there were only a few adult 10-week courses. Now, our introductory course alone fills two sections twice a year, and we are adding several intermediate courses to enable a student to pursue a curriculum in modern astronomy at a popular level for three years.[5]

In one respect both the public presentations and the special courses for adults may be considered formal attempts to broadcast selected astronomical information over a wide area since both are planned and repetitive. However, the nature of the planetarium experience was to be more far reaching than one would expect of the classroom type of lecture demonstration. Because the planetarium is both informative and entertaining, hundreds of non-specialized interest groups

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5. Franklin, Kenneth L. "Careers in Astronomy," Sky and Telescope Magazine, Vol. XXIV, No. 3, September, 1962, p. 128.

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are exposed to science education with little or no conscious attempt to learn. The statement of Hayden Planetarium, New York City, that "Numerous organizations as widely separated as the Society of Electrical Engineers and the Lumberman's Association have engaged the planetarium for private performances"[6] could be said to be equally true of any of the major planetariums in the country. As an example, the records of Longway Planetarium, located in one of the smaller cities, clearly demonstrates the wide divergency of interests one can expect to find in groups contracting for private performances:

Asbury Methodist Church
Business and Professional Women's Group
Reorganized Church of Latter Day Saints
Society of Tool Engineers
Opti-Mrs. Club
Flint Society of Medical Technologists
Flint Rotary Club
Bad Axe Rotary Club
Central High School Senior Class
Job's Daughters

This group represents only organizations that rented the planetarium for special paid programs during the year 1962. That portion of admissions listed as "Special Demonstrations - no charge" lists approximately one hundred organizations during the same period and demonstrates with greater clarity the divergency of the organizations within adult society who avail themselves of the planetarium experience in science education.

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6. American Museum-Hayden Planetarium, Published by same. Revised in 1961, page 24.

It is often the tendency of the public to disregard the great volume of quality work done in science education in favor of something much smaller but more spectacular. The training of America's first group of astronauts was certainly spectacular enough to capture the attention of both press and public. The report of Sky and Telescope in 1962 was only one of many reports dealing with the processes involved in preparing the astronaut for his ultimate mission. "Part of the extensive training by Schirra and his back-up pilot, Major L. Gordon Cooper, Jr." the article said, "was astronomical." It is important for an astronaut to be able to recognize stars seen through the viewports of his capsule, and be able to check its altitude and angular estimates of yaw. The two men received special preflight training at Morehead Planetarium, Chapel Hill, North Carolina."[7] The importance of such work cannot and should not be minimized, but the true responsibility of the planetarium lies not in preparing the few who will actively participate in our new adventure but rather the millions who will only sit and watch.

There can be little doubt that the planetarium is playing an ever increasing role in the education of all, both young and old alike. The pressures of the age demand release through knowledge. The newly discovered mysteries of the universe demand answer through knowledge and man, clothed yet in

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7. "Schirra's Flight," (no author listed), Sky and Telescope Magazine, Vol. XXIV, No. 5, November, 1962, page 247.

the ill-fitting garments of the past, demands new apparel for the new age. Joseph Miles Chamberlain made this comment on the charge that has been placed before our planetariums:

> The time may not be far distant when planetariums will be as numerous as museums. In this age of emphasis on science, such a trend is more than welcome; it is mandatory. For, in the modern context, "planetarium" connotes a great deal more than a model of the solar system. It refers not only to the instrument and its great hemispherical dome: the word goes on to embrace exhibits concerning astronomical, navigational, and related subjects, and instruction in a field of interest that weighs ever more heavily on today's imaginative accomplishments along the new frontier of outer space. In the second half of the twentieth century, centers in this field are no longer the playthings of latter-day Earls of Orrery: instead, they are very nearly necessities for most modern communities.[8]

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8. Chamberlain, Joseph M. "The Sky in Replica," a reprint from Natural History Magazine, Vol. 69, No. 2, 1960.

## CHAPTER IV

## ELEMENTS OF PROGRAMMING

### Preparing the Materials:

The universe of the planetarium is a wide one, but it fails to challenge our concepts of infinity. An unpredjudiced appraisal of the medium quickly convinces the planetarium practioner that his medium is neither infinite nor universal. Where the movie producer is free to select numerous backgrounds and themes that run the complete gamut of human emotion, the planetarium operator has no such freedom. The planetarium operator is, due to the inherent nature of the medium itself, confined to the background of the heavens that his basic instrumentation and auxillaries dictate.

In preparing the material for programming the basic context of the evening sky cannot be ignored. If a theme can be related to a planetarium audience without using the planetarium illusion then it follows that it is largely the property of some other medium, not the planetarium. However, one frequently finds programs related to such subjects as geography, geology, history, holiday, and meteorology. The principal question that must always be answered is, "Is the relationship between the material and the context in which it is to be offered obvious enough to justify its inclusion in planetarium programming?"

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During the month of December in 1962, all of the major planetariums were featuring the traditional Christmas program. The content of this particular program has been printed in booklet form by three of the major planetariums: Morehead of North Carolina, Morrison of San Francisco, and Adler of Chicago. Although the approach is slightly different in each of the three booklets the basic content is comparitively constant, combining religion and astronomy.

A brief analysis of the booklet "The Star of Bethlehem" published by Adler Planetarium of the Chicago Park District illustrates clearly how topics that superficially do not relate well to science may be produced effectively in the planetarium medium. Specifically, "The Star of Bethlehem" is a booklet of approximately three thousand words. A brief analysis of its content in terms of a percentage relationship to the whole provides us with the following facts: (1) Approximately sixteen hundred words or fifty per cent of the total content is devoted to selected and related aspects of astronomy; (2) Six hundred and sixty words of the content deal with the establishment of time and the calendar as they to the Christmas celebration; (3) Three hundred and thirty words of the total are used to explain the astrological significance of the "star" as it related to Magism of early Persia; and (4) The remaining twenty per cent of the content is devoted to Biblical and historical materials.

In programming it is necessary, not only to relate the subject matter to the medium, but also to relate the subject

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matter in such a way that the optical system of the planetarium is displayed to its maximum advantage. As Nicholson has commented, "It is almost an axiom in large planetariums of the United States that nothing is described in the lecture that is not also supported by some visual material."[1]

"The Star of Bethlehem" not only fits the subject matter to the medium, but it also offers the planetarium operator the opportunity to make maximum use of the basic instrument and its auxillaries. Further reading of "The Star of Bethlehem" reveals that there are five basic effects necessary to support the material. They are: (1) the generation of the ecliptic path by the sun, (2) the natural phasing of the moon in its orbit about the earth, (3) the apparent motion of the sun as it marks our summer and winter solstice points, (4) the natural designation of constellation positions, and (5) the apparent motion of the three naked-eye superior planets. In addition at least three auxillary effects are necessary in order to support the material content of the program: (1) a projection of a meteor shower indicating a clearly marked radiant, (2) a projection of a comet in apparent motion among the stars, and (3) a projection illustrating the growth and development of the nova and supernova.

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1. Nicholson, Thomas D. "The Planetarium Lecture," Curator, Vol. 11, No. 3, 1959, page 271.

Since programming must be determined in light of the basic instrumentation and its auxillaries, it is advisable to be cognizant of the limitations and latitudes allowed during the organization of program materials. The following list of basic and auxillary effects is common to all types of major instrumentation now in operation in this country.

Basic Instrument Effects

1. Stars
   - all stars down to 6m.
   - all stars visible from any latitude position.
2. Sun
   - eclipses
     - total
     - annular
3. Moon
   - phases
   - eclipses
     - total
     - partial
4. Planets
   - five naked-eye
5. Motions
   - diurnal
   - annual
   - precessional

Basic Auxillary Effects

1. Complete celestial co-ordinates.
2. Proper motion overlay of Ursa Major.
3. Three types of Aurora Borealis.
4. Sunrise and sunset effects.
5. Geocentric earth projector.
6. Earth satellite projector.
7. Constellation projectors.
8. Meteor shower projector.
9. Bolide projector.
10. Comet projector.
11. Sumner bearings and astronomical triangles.

It may appear that such an impressive array of instrumentation should offer unlimited selection in the material content of planetariums, but judgment such as this is illusionary. If the planetarium is to fulfill its assigned obligation to acquaint the public with those facets of science affecting their daily living patterns, then the scope of augmentation must be expanded. For example, a few basic astronomical concepts, important to all planetarium programming, that cannot be demonstrated by the aforementioned supports are listed below.

1. Even though the stars can be made to drift across the sky, the audience cannot see the earth rotate on its axis.
2. Even though the sun can be seen moving along the ecliptic, the audience cannot be shown the revolution of the earth.
3. Although the apparent raising and lowering of the sun's position can be demonstrated on the meridian, the audience cannot be shown the earth's polar axis as it is inclined to the plane of the ecliptic.
4. Although an earth satellite can be projected moving among the stars, the launching of the rocket and the orbit established cannot be shown.
5. Even though artificial reddening, sun dogs, halos, and other meteorological phenomena can be discussed, the actual cause of the phenomena cannot be demonstrated.

The list of such "cannots" is as infinite as the universe with which the planetarium deals, and yet, such blocks to ready visualization need not deter programming in these particular areas. The planetarium workshop has as its function to support the basic instrumentation and the basic auxillary instrumentation in such a way that each support of the theme becomes easily understandable even to the most uninterested and most unenlightened audience. The men who man these important workshops are more than electricians, opticians, and machinists and they are much more than "gadgeteers," as some have called them. These men have the responsibility to provide, through their creative genius, those aspects of programming that cannot be purchased at any price.

Preparing the Advertising:

It is unfortunate that concern with the public image has become passé in such a short period. Any institution that deals in goods and services, any institution that modifies or adjusts its product in terms of feedback from the consumer, any institution whose success or failure is translated in terms of quantitative nature must be extremely sensitive in its regard of the public. Since the planetarium is a community institution, functioning within the boundaries of certain pre-described determinants, it must, if it is to be successful over a long period of time, be sensitive to outside pressures and be in a continual state of adjustment to the changing requirements of the times. This does not mean to imply that the planetarium must always follow the social-scientific caprices of the public. On the

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contrary, there are times when the planetarium must strike off alone into new areas but, as with all types of public institutions, there must be maintained a healthful interchange between the two extremities of action.

One of the factors influencing the public planetarium image can be seen in the allegation that planetariums, like art galleries and museums, are the playthings of the idle rich. A glance at the names attached to the major planetariums would appear to lend credence to such an allegation since nine of the eleven bear the names of principal donors or benefactors. However, a careful study of the lives of the men after whom these institutions are named would clearly indicate that there is to be found in each instance a sincere concern for the fellow man, a sincere desire to relate man more meaningfully to his greater environment.

If the planetarium is to function as a useful institution in the society that creates it, that is, if it is to transmit the knowledge of astronomy over the broadest population base, then public opinion, correctly or incorrectly founded, must be shaped through the process of programming.

In 1962 the assistant editor of one of Michigan's daily newspaper stated that he regretted that he was having difficulty in finding space for planetarium news because the comic page was already so crowded. The remark was not intended to be facetitious. Behind it lay the sincere belief that planetariums were for children. Perhaps some planetarium personnel have themselves constructed this particular public image because it is usually easier to attract large numbers of children than to attract large numbers of adults. Children are more frequently members of captive groups than are adults. The figures collected from the reports of the planetarium directors of the United States do not corroborate this particular image.

The total figure of school attendance of 5,791,192, as previously mentioned in the compilations of the directors' reports, does not tell a complete story. The percentage comparison of school attendance to total attendance ranged from a low of one per cent for the United States Air Force Academy Planetarium to a high of seventy-two per cent for Morehead of the University of North Carolina. As an average, each of the major planetariums had 33.65 per cent of its total attendance composed of young people attending in special school groups.[2]

Another public image of the planetarium can be seen reflected in the statement, "I don't want to go there. It would be too far over my head." The regrettable fact about this expression of image is that it is often true. In the too-professional planetarium one finds that not only the central objective, but the only objective, is to teach the science

2. Figures compiled from reports presented in Philadelphia, Pennsylvania, May, 1963.

of astronomy. While such a philosopny, viewed independently of its periferal associations, seems both fitting and proper to its objective, it often leads to serious omissions in making use of the instrument's capabilities. There one discovers too much reliance on fact and too little on fascination.

At the other end of this continuum one finds the planetarium that is too non-professional. Here the visitor is subjected to all kinds of misinformation and the showmanship involved in the planetarium programming tends to be almost comic-bookish in its approach. Where the too-professional planetarium tends to enforce apathy, the too non-professional planetarium tends to encourage ridicule of the very science it was designed to promote. Perhaps the book issued by Spitz Laboratories presents something of the compromise that must be made between these two public image extremes:

> As you become familiar with the planetarium lecturing techniques you will find this unusual classroom session is capable of a little more than the ordinary educational experience. In a sense the planetarium offers a chance for a bit of theater -- the correct combination of lighting, illusion and the spoken word. It need be no more spectacular than this. A "Trip to the Moon" is not necessary to hold the attention of the group.[3]

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3. Early, Roger Neil. The Use of the Planetarium in the Teaching of Earth and Space Sciences, published by Spitz Laboratories, Inc., Yorklyn, Delaware, 1960, page 4.

In the summer of 1960, the Robert T. Longway Planetarium decided to conduct a community survey in order to determine the effectiveness of its public relations program to modify, if necessary, the approach to the media regarding the programming and purposes.

The questionnaire was designed to reveal the listening, viewing and reading habits of a randomly selected population drawn from within the city limits of Flint, Michigan. In addition, the questionnaire was designed so that an accurate image of the planetarium might be determined from the responses and so that a public preference in periodic advertising might be expressed.

The survey was by no means a comprehensive one. A total of one hundred and one Flint families were selected to generalize to a total population of approximately 200,000. It should be pointed out also that the survey was not intended to pose as scientific research. Rather, the only intention of the survey was to reflect the attitudes and preferences of a community at the time the questionnaire was administered.

In order to determine the attitude of the public toward the Robert T. Longway Planetarium four picture cards were prepared. Each card represented a different age and economic grouping of people. The respondents were then asked the following question: "The planetarium wishes to use a picture in its advertising that will best represent its activities to the public. Here are four different groups of people. Which group do you feel would most correctly represent the activities of Longway Planetarium to the people of this city?" The tabulation of responses was as follows:

TABLE I. DETERMINATION OF THE ATTITUDE OF THE PUBLIC TO THE PUBLIC RELATIONS PROGRAM OF THE LONGWAY PLANETARIUM

| Group Selected | Number of Choices | Percentage of Total |
|---|---|---|
| Group I (Consisting of husband, wife and two children) | 62 | 61.4 |
| Group II (Consisting of one girl and one boy) | 19 | 18.8 |
| Group III (Consisting of one man and one boy) | 3 | 3.0 |
| Group IV (Consisting of one man and one woman, expensively dressed) | 10 | 9.9 |
| Group V (No answer group) | 7 | 6.9 |
| Totals | 101 | 100.0 |

The results of the survey, although perhaps inconclusive because of the population sample, seem to indicate the type of public image most desirable if a planetarium is to function at optimum effectiveness in the community. The correct reflection of such opinion is always important, but as the size of the community being served decreases, the importance of the image in the public mind increases proportionately.

The directors of the major planetariums have issued a statement for communities interested in establishing a new planetarium. The statement purports that an annual attendance of about five per cent of the area population can be expected to attend the planetarium. In a large, heavily populated area this is probably adequate, but in smaller communities this percentage is insufficient. Therefore, every effort must be made, particularly in the smaller communities, to keep the public image balanced in such a manner as to be attractive to the largest potential audience.

The nature of planetarium programming is such as to present a serious problem to effective advertising. The analogy of the public program at the planetarium to that of the movie at the city theater is not a good one, but the similarity certainly extends to the fact that the existence of both depends on the voluntary patronage of the public. The movie theater, however, changes its program weekly, thereby forestalling any theoretical saturation and providing, at the same time, a continually fresh approach to advertising the product. The average planetarium program lasts for at least a month and some, particularly during the summer months, may run as long as three months.

All planetariums have their origin in that nebulous undefinable something called community spirit and it is obligatory that the planetarium develop the type of program that can be truly classified as community service. Once this label has been firmly bestowed upon the planetarium, the possibilities for inexpensive advertising become practically unlimited. Briefly, let us consider only a few of the possible avenues of approach available to the community service-centered planetarium.

Radio Advertising:

The planetarium is in the market to sell a product, specifically, knowledge, and being placed in a competitive market where it is competing for a portion of the leisure time of the working adult, it becomes extremely important to analyze each medium well and approach it in the best possible fashion. A correct analysis and approach to this area of radio advertising is more difficult than the approach to other forms of the mass media because of an unfortunate stereotype that has developed.

About 1948, the broadcasting industry began to adapt a basic music-news format. From this basic shift in broadcast policy developed the stereotype of radio as serving only the great mass of screaming, jumping adolescents. Since this type of person is not usually attracted to programs that can be offered in a planetarium, the tendency is either to ignore the potential of the medium completely or to slant the prepared material in such a fashion that it will appeal to the caprices of the adolescent. That is that this stereotyped notion of radio potential, as is generally true with all stereotypes, is only partially true.

In 1945, and again in 1947, the National Opinion Research Center of the University of Chicago made a survey of radio listeners at the request of the National Association of Broadcasters. The results showed that forty-two per cent of the listeners were at least high school graduates and forty-six per cent of the listeners interviewed were between the ages of twenty-one and thirty-nine.[4] Disappointing perhaps to planetariums, which are generally located in large metropolitan areas, is the fact that radio listening increases perceptably in less urbanized areas.

In 1959, William O'Hallaren analyzed a more contemporary radio audience in these rather uncomplimentary terms:

> There are many adults for whom radio is almost an unbreakable habit, no matter how surly it gets. These people find it a companionable noise while ironing or fighting traffic. There are always some waiting for the weather, the news, the baseball scores, or the word that the single tax has at last been adopted. There are the blind, the lonely, the people who lug portables to beaches and parks.
>
> These are the core of the radio listening public, long suffering, inured to insult, always available as survey statistics. Their number never grows, but nothing erodes it very much either.[5]

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4. Hazersfeld, Paul F. and Kendell, Patriac H. Radio Listening in America, (New York: Prentice-Hall, Inc., 1948), pp. 123 ff.

5. O'Halloren, William. "Radio is Worth Saving," Atlantic Monthly, Vol. 204, October, 1959, pp. 69-72.

Likewise, in planning a program of radio advertising, the director of a public institution, such as a planetarium, must not forget the phenomenal growth of the FM station nor its somewhat distinct role in radio broadcasting. As C. P. Gilmore has pointed out, "The sale of FM receivers . . . has soared from fewer than 200,000 in 1955 to some two million in 1960."[6] Correctly, or incorrectly, these two million listeners are assumed to be somewhat more selective in taste than are their comparable counterparts in AM listening and consequently programming is ordinarily designed with the selective listener in mind. It is this practice, that of putting on a variety of programs to attract special-interest audiences rather than catering only to the majority, that has been called "narrowcasting" rather than broadcasting.[7]

The determination then as to who is the audience and what is the audience is somewhat nebulous, but it does seem certain that it is not all juvenile. Therefore, preparation of radio advertising must be such as to appeal to all segments of the population equally. The salesmanship of science education must not be limited to any single strata of society because of incorrect emphasis and improper planning.

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6. Gilmore, C. P. "Tune in on the FM Variety Show," Reader's Digest, Vol. 78, June, 1961, pp. 193-8.

7. Gilmore, ibid.

Since radio stations, like every form of the mass media, depend solely on the quality of their product to appeal to the great mass of people it follows that even in their public service advertising and production they must constantly guard against inferior workmanship, discarding the material that is badly written and poorly produced and selecting those materials that have been tastefully executed. This means that planetariums wishing extensive radio coverage of their programs must see to it that material intended to be read by station employed announcers is prepared in the best possible radio style, or better yet, public service institutions should program their own materials and submit them in tape or cartridge form to the stations within the area.

Television Advertising:

No institution depending on public patronage can long exist if its advertising methods are delegated to a single medium approach, even one as deeply penetrating as radio. It is better that advertising forms be as varied as possible in order to reach each layer of the potential market for knowledge. It would be difficult to ignore "the David" of the industry even if one wanted to. No other form of mass communication reaches so many families in such a concentrated form. Consequently, no other medium offers such a fertile field for effective planetarium advertising.

The established facts are that in 1961, eighty-eight per cent of the households in the United States had television sets. These sets were in operation on an average of five hours per day. Evidence of the popularity of the medium is that in 1950 there were one hundred and four TV stations in operation but by 1960 the number had increased to four hundred and thirty-one. "Television," said John P. Cunningham, chairman of Cunningham and Walsh Advertising, "has become a firmly established member of the American family: it ranks with the automobile (and even the home itself) in terms of family concern."[8]

Research has left little doubt that television is an admirable salesman of all sorts of products. It is reported that Steve Allen recommended a book called Brotherhood of Evil in a casual thirty-second spiel and the next morning four thousand copies were sold.[9]

The planetarium wishing extensive television news coverage of its programs would do well to remember the simple but important difference between this medium and radio. Therefore, advertising material must be prepared so as to fit specifically into the framework of the medium. Although a well-written piece of radio copy may show some scattered results when mailed to radio stations, the same copy would, if submitted without supporting visuals, be ignored by television broadcasters. These supports must also be executed to

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8. Television and Radio, edited by Payntz Tyler, published by H. W. Wilson Company, New York, 1961, page 45.

9. Television and Radio, loc. cit., page 47.

fit the limitations of the medium. Special attention in art preparation should be given to contrast rather than to color and although stations may use artwork just as it has been prepared, the probability of its use is increased if it is copied on 35 mm film and attached to the written copy.

The planetarium, when considering the effect of advertising as an element of programming, should never underestimate the value of indirect promotion. As a repository of a specialized body of knowledge and as a repository for the specialized talent for distributing that information in meaningful form, the staff of any planetarium will have ample opportunity to place the institutional image before the public through the medium of television.

Again the specter of mistake beckons enticingly to the planetarium director or his communication man. It is the specter of public service, that leads to the mistaken idea that quality is unimportant. It is true that Newton N. Minow, president of the Federal Communications Commission, has threatened strict enforcement of this license qualification, but even under the most strict interpretation, local television stations are free to define for themselves that area that lies outside the area designated as seventy per cent entertainment.

Newspaper Advertising:

Each year the newspapers of this country subscribe to numerous syndicated science columns. Each day service wires bring assorted pieces of information to the city desk, material that must be sorted, elaborated upon and then accepted or rejected in light of a quality decision. The continual, and often spectacular displays of the heavens, keep the telephones busy at the local newspaper office. It is under these conditions that the specialized knowledge and capabilities of the planetarium staff are most required. The local newspaper and planetarium can, and should, establish a cooperative relationship to provide both direct and indirect advertising, consequently exerting an important, positive influence on programming.

In the spring of 1960, Ralph B. Curries, editor of the Flint Journal, Flint, Michigan, posed an interesting question that was to have far-reaching consequences in the area of newspaper advertising. Although the newspaper, as a matter of course, carried special articles and editorials dealing with newsworthy aspects of the planetarium programming, the question was how to place program information before the community on a day-to-day basis. Less than one month later the question was to answer itself in such a fashion as to provide benefit to both the planetarium and the newspaper.

One of the syndicated articles coming to the newspaper desk for consideration dealt with the times for observations such as rising and setting sun, rising and setting moon, and miscellaneous observations that might be of interest to amateur enthusiasts in the area of astronomy. It was decided,

after careful consideration, that the same information could be provided from a local source more conveniently and with equal or greater accuracy. At the same time, the column would also allow for mention of special and continuing programs at the planetarium.

The daily "Skies Over" column became a reality of newspaper advertising when the computer of General Motors Institute was offered for use in computing the data needed for the astronomical phenomena.

The idea of daily advertising for the planetarium combined with a daily service for people of the community seemed to be such a good idea that other newspaper editors in Michigan were approached with the possibility of incorporating the feature into their daily format. The following newspapers now carry the program regularly:

The Flint Journal, Flint, Michigan
The Jackson Citizen Patriot, Jackson, Michigan
The State Journal, Lansing, Michigan
The Saginaw News, Saginaw, Michigan
The Pioneer, Big Rapids, Michigan
The Muskegon Chronicle, Muskegon, Michigan
The Traverse City Record-Eagle, Traverse City, Michigan
The Port Huron Times Herald, Port Huron, Michigan

Although advertising such as this has little immediate effect on planetarium attendance, its cumulative effect on image building is of inestimable value.

This example of advertising by Flint is only one of many possibilities for promoting planetarium programming. The three important qualities of newspaper advertising; qualities that must be given serious consideration by any institution engaged in day-to-day marketing of a product are repetition, localization, and intensification. These traits are emphasized in the recent book <u>Advertising</u> in the following way:

> The newspaper is primarily a local advertising medium. By a diversity of editorial content and emphasis on local news, it appeals to people of many different types within the community it serves . . . The newspaper provides intensive coverage of local markets at relatively low space costs, and the advertiser cannot only time the delivery of his message for the most advantageous day, but he can also get it published via very short notice, in many cases, within a few hours.[10]

<u>Oral Communication in the Planetarium:</u>

If one considers the public speech to consist of only the three basic elements of speech, speaker, and audience, then there appears to be no difference between the platform speech and the planetarium lecture since all three of these elements unquestionably exist in both. A reading of Nicholson's article on the planetarium lecture would lead the reader to concentrate on the similarities and ignore the differences that exist. For example, Nicholson says, "At its (the planetarium lecture) best, it combines the formality of the lecture hall, the spontaneity of the classroom, the exhibitionism of the museum, the showmanship of the theater, and the casualness of conversation."[11]

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10. Wright, John S. and Warner, Daniel S. <u>Advertising</u>, (New York: McGraw-Hill Book Company, Inc., 1962), pp. 168-9.

11. Nicholson, <u>op. cit.</u>, page 269.

Nicholson does, however, touch on a few of the dissimilarities existing between the two processes in the following paragraph:

> The lecturer's presentation should be fluent, casual, authoritative, and interesting. At the same time, he must have the presence of mind and dexterity to control the projection planetarium and his share of the supporting visual effects without interruption in his presentation. It is very often imperative that he maintain a rigid time schedule, not only for the duration of the lecture, but also in timing the sequences that are part of it so that they coordinate precisely with visual effects.[12]

The planetarium lecture is exactly what the name implies. It is a public lecture, and as such it is subject to all the rules and restrictions used to determine the requirements of any good platform speaking. If there is a difference, and indeed there are many, that difference lies not in the basic application of the rules, but rather in the additional restrictions the inherent nature of the medium imposes upon the speaker.

Unfortunately, there has never been anything invented that will act as a synthetic for knowledge, and no instant wonder drugs have been developed that will give the speaker a proper command of his subject. The fundamental that there can be no substitute for knowledge holds true for all speakers, but most particularly for speakers dealing with technical and scientific materials. The planetarium lecture,

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12. Nicholson, loc. cit., page 274.

exclusively related to some aspect of the science of astronomy, demands of its lecturers the highest command of its subject matter, for only he who has mastered its content will be able to teach it simply and effectively.

The converse of this position is not implied. The statement is not meant to imply that each student of astronomy, if well acquainted with its subject content, will also be possessed of those qualities that make a good planetarium lecturer.

The nature of our educational system is such that it has created a false dichotomy between the arts and the sciences. The implication is that no common meeting ground can exist between these two divisions of human knowledge. If we accept the Aristotelian definition of speech as an art, then we must also accept the fact that many college students majoring in the sciences refuse to recognize the values of speech in the total life picture of man. The simple fact that man must always relate his ideas linguistically to his fellow man is all but forgotten in the meaningless chasm we have constructed. The frequent lack of this necessary combination has caused many planetarium executives to search for men who have the ability to express their ideas effectively and then, realizing the need for extensive knowledge in the subject area, offer special classes and seminars for the purpose of future planetarium lecturers.

The planetarium lecturing situation is, in many respects, a different kind of speech experience than the one in which

the accustomed platform speaker finds himself. Where the platform speaker learns to be aware of such aspects of personality as dress, appearance, posture, and eye contact, the planetarium lecturer finds these aspects to be of only minimal importance. The planetarium lecturer may have as much as three to five minutes of personal contact with his audience, but as soon as the lights go down and the planetarium illusion is completed, the lecturer becomes nothing more than a voice out of the darkness, building emotion and coaxing the listener to move from known dimensions into the unknown and yet unexplored dimensions of his universe.

As a general rule, the position of the speaker's stand also prohibits the planetarium lecturer from assuming the same relationship with his audience as does the platform speaker. Where the platform speaker is placed in front of his audience, the planetarium lecturer is ordinarily placed behind it. Since the operating console is always in the north, and since the nature of the medium dictates a spherical inner-dome structure, the planetarium lecturer must always be behind at least half of the audience.

Not too many years ago the student aspiring to become an accomplished platform speaker was presented with a comprehensive list of gestures which he was expected to memorize. Each gesture was carefully calculated to demonstrate a particular emotion or emphasize a particular point. Although the concept of good public speaking has changed considerably since the days of elocution, bodily motion is still considered to be a desirable quality. To the planetarium lecturer, however, any value of such motion is lost since he is working unseen by his audience. A great amount of manuel dexterity is required of him, to be sure, but it takes the form of coordinating his effects with the content of the material he is presenting. Correct manipulation of accompanying visual effects is so important that the planetarium lecturer often uses an outline that is divided into two parts. One part is devoted to the material content of the program and the other devoted to the accompanying effects.

Another major difference between platform and planetarium speaking lies in the area of what might be appropriately referred to as social binding forces.

The platform speaker must be able to analyze the audience in each of their many aspects in order to be able to most effectively communicate his own ideas. Such an analysis is also necessary in order that he might more easily channel the reaction of his audience toward his communication into its most meaningful patter of response. Fortunately for the platform speaker, this analysis does not take place in a social vacuum. With each audience the platform speaker faces he finds a kind of binding force which allows him to make his judgments with a fair degree of accuracy. The words organization, club, or assembly connote some form of homogeneity based upon some solidly discernible premise.

The planetarium lecturer can expect to find no such binding force existing in the average audience attending the public presentation. It would be disasterous to assume that each person attending such a program does so because of an overpowering interest in the science of astronomy. Many planetarium patrons attend because of interest, to be sure, but others may be attending simply because it is cheaper than going to the movies or because the darkness and the music are conducive to a good hour's rest. In addition, the typical planetarium audience cannot be grouped or analyzed according to age. The lecturer may be speaking to children as young as six and adults as old as eighty. The search for a common denominator among planetarium audiences can be frustrating simply because no such thing exists. The lecturer is forced, therefore, to search out some suitable middle-ground approach in the presentation of his material, causing some to reach on intellectual tiptoe to grasp his ideas while others in the same audience will be forced to stoop slightly in order to gather the material up to the eye-level of the intellect.

# CHAPTER V

## THE PILOT STUDY

### The Composite Problem:

The many facets of planetarium education will not allow the institution to be identified qualitatively with any particular educational or social strata of the community. The label of the "Rich Man's Toy" or the "Poor Man's Movie" must be carefully avoided by developing such diversity within the programming as to be of value to all segments of the community within which the institution functions. Failure to program effectively so as to appeal to the maximum number of adults can only result in the progressive decay of the value of the institution.

There are, as we have seen, several important aspects to successful programming. Basically, however, it should be reiterated that programming should consist of: (1) the effective use of the basic instrumentation, (2) the correct selection and employment of accompanying visual supports, (3) the best use of all available means to inform the general public as to the periodic changes in programming, and (4) the program itself which consists compositely of the written word and the spoken word. Each of these contributing elements must be brought into effective use in order to create a pleasurable and effective learning situation. The neglect of any of the aforementioned elements will result in only a partially adequate science education for the people of the community.

Many articles have been written as to the use of the planetarium in today's scientific, space-centered society. Each author of each article has assumed, because of its long and impressive history, and because of the prestige the planetarium enjoys in its relationship with the space sciences, that it is an excellent teaching device; yet, in spite of the millions of people exposed annually to the magic of its self-contained universe, no research is now available in which the correlation of planetarium programming to adult learning and habits has been carefully analyzed.

Scope and Limitations:

Since this study was designed to provide a comprehensive overview of the effectiveness of planetarium programming as it relates to the needs and desires of the adult, it was necessary to, wherever possible, correlate a series of data pertinent to the stated thesis of the investigation. If one ascribes no more than a quantitative aspect to the improvement of programming to adults, it has merit since it may be assumed that the planetarium experience for many non-school adults is the only accurate interpretation of those scientific events so important in the shaping of our contemporary society. This investigation was designed to isolate and identify selected patterns of response among community adults who, through occasional participation in public program offerings, are subject to what might be referred to as non-sequential science education.

This study assumed that the adult within a given community could be analyzed in regard to specific aspects of behavior patterns and responses, but the study did not assume that all non-experimental variables could be controlled in order that statistical levels of significance might be assigned with unerring accuracy. The investigation, it was understood, would be evaluated on the basis of design and on the basis of the data collected specifically in the investigation. Also, the study of the adults within the community was designed to determine to what extent, if any, planetarium attendance tended to influence the attitude of the adult toward the projects of space research undertaken by the Federal government. Third, the study was designed to measure the extent to which planetarium attendance as a form of incidental science education would provide the average adult with a workable vocabulary that would assist him in the interpretation of the space-age events that play an increasingly important role in the life of the well-informed citizen.

General aspects of the study, specifically responses to Questions ten and eleven, were to be subjected to statistical analysis, but due to the nature of the population and the necessary methods of data accumulation and treatment, it was decided to delay the assessment of statistical levels of probability and to analyze the results of the pilot study only in terms of tendency as they appeared to deviate from an expected norm. The latter seemed to be a more appropriate evaluation to the interpretation of the collected data.

The Instrument:

The measuring instrument was designed to be as brief as possible and still supply the data necessary to present an accurate composite picture of the adults attending public programs at one of the major planetariums included in this study. Although the questionnaire was specific enough in its design to measure certain pre-selected areas of response and reveal certain patterns of cultural inter-relationship, it was, theoretically, flexible enough to permit it to function in any community where the planetarium operates adjacent to or in conjunction with other cultural facilities.

The respondent was informed that it was not necessary that the completed form be signed, but personal data such as sex, age, and education were requested in anticipation that they might later serve as functional determinates in the analysis of the data.

Since one of the major elements of planetarium programming must concern itself with the most effective proliferation of information, the first five questions were designed to determine if differences existed in the medium exposure habits of those adults who attended planetarium programs from those who did not.

The five medium items were:

1. How many hours a week would you estimate you spend viewing television? ______

2. How many hours a week would you estimate you spend listening to the radio? ______

3. How many novels would you estimate you have read during the past year? ______

4. Please list in the order you usually read the newspaper: (Let "1" stand for the section you usually read first.)

   Sports _____ Feature _____ Editorial _____

   Classified _____ Social _____ Comics _____

5. How many movies have you attended during the past year?

The next two questions appear at casual reading to be repetitive. However, a closer examination as to purpose and intent shows that question six is designed to provide data representing the cumulative effect of the planetarium experience, while question seven is designed to provide data concerning the immediacy of the experience.

6. How many times have you attended public programs at the Robert T. Longway Planetarium?

7. How many times have you attended public programs at the Robert T. Longway Planetarium during the past year?

Questions eight and nine were included in the instrument in order to determine to what extent inter-cultural relationships may exist between adults who attend planetarium programs and those who attend art galleries and theater programs.

8. How many times have you attended plays at the Bower Theater during the past year?

9. How many times have you attended a special showing at the DeWaters Art Institute during the past year?

One of the major decisions facing the adult in this age of space exploration is the degree of justifiability of large government expenditures of tax money on rockets, missiles, and satellites. It was hypothesized that those adults who avail themselves of planetarium programming would, because of an increased understanding, be more likely to recognize the justification for those expenditures. In order to check this hypothesis, a ten-place continuum was designed ranging from an extreme negative position labeled "completely unjustified" to an extreme positive position labeled "completely justified."

In order to determine the effectiveness of planetarium programming in providing the adult of the community with a knowledgeable vocabulary that would assist him in understanding the complexities imposed upon him through popularization of science and technology, a list of twenty-five terms for identification was included in the instrument.[1] This list

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1. See Appendix I.

of terms was compiled by using the booklet, Short Glossary of Space Terms, published by the National Aeronautics and Space Administration.[2] The publication contains a total of four hundred and eighty-six terms relating to assorted aspects of astronomy and associated areas. Wishing, as previously stated, to determine the extent to which the adult planetarium patron was familiar with these terms, but not wishing to use all the terms, a translation into three place numbers was used jointly with a random numbers table in order to secure an unbiased selection of the final twenty-five terms which were included in the questionnaire.[3] These terms were then incorporated into the questionnaire to be used in the pilot study.

The Distribution:

Several possible alternatives concerning the distribution of the questionnaire in this pilot study were considered. One possible method would have been the randomization of the mailing list employed by the planetarium. However, since the purpose of the investigation was to reveal selected traits and patterns of responses among the typical adult population of the community, the consideration of this particular pro-

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2. Short Glossary of Space Terms. William H. Allen and B. A. Mulcahy (editors), National Aeronautics and Space Administration, March, 1962.

3. Dixon and Massey. Introduction to Statistical Analyses, (New York: McGraw-Hill Book Company, 1957), page 366.

cedure was discarded since it could conceivably weigh the data too heavily in favor of the attending or participating adult. For the same reason the possibility of distributing the questionnaire to adults attending the public performances at the Robert T. Longway Planetarium was also discarded.

In keeping with the stated objectives of the study, it was decided in the summer of 1964 to conduct the pilot study in one of the summer programs being conducted by the community school program in Flint, Michigan. Mr. James Robinson, designated as community zone leader, was contacted regarding the project. The community school directors of the Durant-Turri-Mott School, the Stevenson School, and the Longfellow School, along with Mr. Robinson, assumed the responsibility for the distribution and collection of the questionnaires. A total of eighty questionnaires were distributed and a completed group of fifty-two were returned for tabulation and analysis.

Grouping the Responses:

One of the principal objectives of the study was that of determining conclusions based on a study of the average adult population within a given community. The pilot study, due primarily to a limitation of numbers, did not present a typical adult sampling of the City of Flint, Michigan. Although the sex sampling was approximately equal, twenty-seven female and twenty-five male, the general educational level of the respondents were far too high to be considered as typical in a highly industrialized city. One respondent of the total had completed only a formal eighth-grade education, but the average formal schooling for the group returning the questionnaire varied between fifteen and sixteen years.

The data collected in the pilot study were analyzed in order to provide information regarding the basic purposes of the research design. These included:

1. Sex Differences. To analyze and determine how these differences affect the mass communication media, and to determine, wherever appropriate, how sex differences affect the collected data of the survey.
2. Information Level. To analyze and determine to what extent the planetarium programming operated as a factor in providing the adult with a functional vocabulary for space-age living.
3. Educational Level. To analyze and determine the extent to which the educational level of the adult in a community operates as a factor in planetarium attendance.
4. Attitude Expression. To analyze and determine the effect of the planetarium as it relates to space expenditures at the national level.
5. Immediacy Factor.. To ascertain to what extent the immediacy of the planetarium experience affects the individual in both vocabulary and attitude.

Analysis of Sex Differences in Media Exposures:

Movies. The pilot study indicated no basic differences regarding the number of movies attended between males and females. The total number of movies attended by the males responding to the questionnaire was one hundred and forty-six while the total number of movies attended by the females was one hundred and thirty-nine. This gave a result of 5.84 movies per year attended by the male population of the respondents and an average of 5.15 movies attended by the females per year.

Novels. The pilot study regarding sex differences in media habits as they related to the reading of novels and the viewing of television seemed to indicate the same consistent pattern as had been previously noted in the analysis of movie attendance. The average female involved in the pilot study tended to read 7.11 novels per year while the average male tended to read only slightly less with an arithmetic mean of 6.88 novels per year.

Television. The male respondents spent a greater portion of their time watching television. The total male scores in this area were two hundred and twenty-one hours per week while the total female scores totaled only one hundred and sixty-four. A quick summary of the distribution arrangement reveals no great dissimilarity about the central tendency so it is safe to assume that the mean scores of 8.84 for the male and 6.07 for the female represent real, although possibly not highly significant, differences in media habits.

Radio. The habit of radio listening seemed to present the most significant sex difference in the analysis of media responses in the pilot study. The average male listened to radio broadcasts 11.52 hours per week while the average female listened to radio broadcasting only 5.19 hours per week. The results represent a probable significant difference. However, there is a factor of extremes that should be considered. The maximum female response to the question was twenty hours per week while the maximum male response was seventy-five hours per week, thus weighting the male responses more heavily than they deserved.

In order to present a more accurate picture of sex differences related to this media, the extreme value from the male scores was extracted from the tabulations, thereby producing a total of two hundred and thirteen cumulative listening hours weekly as opposed to the original value of two hundred and eighty-eight. The total number of female listening hours amounted to only one hundred and forty. Since the number of males in the pilot study was twenty-five, twenty-four if the extreme factor were omitted, and the number for the female was twenty-seven, it was hypothesized that a true and significant sex difference did occur in this media area examined in the pilot study. Radio listening, therefore, was marked for a more complete investigation in the final phase of the experiment.

Analysis of Newspaper Reading Order:

Question four in the pilot study attempted to determine a position order in the reading of the newspaper by the respondents. The purpose of the question was to determine what position, if any, would be most favorable for planetarium advertising.

The tabulation of responses proved that both males and females in the pilot study favored the feature section of their newspaper over the other sections listed in the questionnaire. Thirteen of the men and thirteen of the women marked it as their first choice.

There was a noticeable difference between male and female responses in the second selection according to preference, however. The females of the study listed the social section of the newspaper as their second choice, while the males registered their preference in favor of the editorial section.

The results of the pilot study would seem to belie the stereotype of the American male who reads the sports page of his newspaper before anything else. Only three of the males responding to the questionnaire listed the sports section of their paper as their first reading preference, and as an overall comparison, the sports section was ranked lower than both the feature and the editorial section.

It was anticipated in the construction of the questionnaire that this section would present the greatest difficulty in securing answers since it was a six-position question requiring a quantitative decision applicable to each phase. The results of the pilot questionnaire bore out the anticipated problem since six male responses had to be discarded dur to lack of completion. The female respondents likewise indicated a reluctance to complete the section of the questionnaire, and it was necessary to discard eight of these because of incomplete responses.

Vocabulary Recognition and Planetarium Experiences:

One of the major hypothesis to be tested in the experiment was that those adults of a community who attended planetarium programs were, as a consequence of this experience, better informed citizens regarding the scientific developments of their age. This position was tested by the selection of specific terminology pertaining to astronomy and its related sciences.

In order to check the validity of this position the respondents were divided into two groups; one group composed of those who had never attended a program at Longway Planetarium, and the other group composed of individuals who had had three or more experiences in public programs presented by the planetarium.

The first group included a total of fourteen individuals who had never attended a planetarium program. It was, however, necessary to disregard one of the questionnaires since the respondent had made no attempt to check the question list. A sum of the tabulations for Group One indicated a total of 180 correct responses with an arithmetic average of 13.85 per respondent. The second group, on the other hand, contained seventeen completed questionnaires with a sum of the tabulations equalling 271 correct responses with a mean response per individual of 15.94.

The results of this phase of the pilot study would seem to indicate the basic truth of the contention that the planetarium experience does make a difference to the adult in a scientific society. The results were not subjected to statistical analysis, however, since it was felt that the numbers were so restrictive that the possibility of error was greater than the predictive value of the results.

There is still one other aspect of the investigation into the area of vocabulary recognition that would cast some doubt as to the validity of the experience differences located in the pilot study. Once again it is a sex difference. An analysis of scores according to sex revealed a mean score for the female of 12.04 as contrasted with a mean score for the male of 16.48. In other words, although it appears that the planetarium experience may indicate some tendency to supply the adult with a functional science vocabulary, the results of the pilot study would indicate that a basic sex difference was approximately twice as important as a factor in the same area.

Planetarium Experience and the Expression of Attitude:

In analyzing the results of the pilot study it was necessary to determine if the planetarium experience would, as it had been hypothesized, make a difference in the position people marked as the continuum provided for this purpose. Theoretically, those adults who had attended public programs at the planetarium should have been more in favor of government space expenditures than those adults who had not participated in planetarium programming.

In order to effect this analysis the same groups, with no regard to sex differences, were compared one to another. Again, Group One was composed of adults who had never attended a planetarium program, while Group Two was was composed of adults who had attended planetarium programs three or more times.

A summary of the responses to the item of the questionnaire designed to determine attitude showed some highly unexpected results. It had been hypothesized that planetarium attendance (would produce a more favorable attitude) toward government expenditures for space research. However, the pilot study showed that adults who never attended the planetarium marked a mean position on the attitude continuum of 8.38 while those adults who had attended planetarium programs marked a mean position of only 7.00.

A similar analysis was conducted by separating the respondents into sex groups with no regard as to planetarium attendance. It was found that sex made little difference in attitude since the mean attitude score for the males was 7.4 as opposed to 7.63 for the females.

The pilot study was, as previously stated, weakest in regard to the sampling of the educational level of the respondents. It was hoped that the data from the pilot study, particularly data relating to those areas of attitude and vocabulary recognition, could be analyzed by separating the respondents into various educational levels. Unfortunately, due to the bias of the pilot study, such analysis proved to be impossible.

# CHAPTER VI

## THE COLLECTION AND ANALYSIS OF DATA

### Revision of the Measuring Instrument:

During the fall of 1964 the questionnaire used in the pilot study was revised in preparation for the final phase of the investigation. The revision was accomplished with the assistance of the Bureau of Educational Research at Michigan State University.

Not only was the evaluation conference initiated to consider the form of the questionnaire, but also to determine to what extent the instrument met the criteria of the experimental design for which it had been prepared. Inherent in the considerations was the need to modify, wherever necessary, those elements of the questionnaire that would provide for a more distinct separation of groups; inclusion of material that would provide for better control over the many variables superfluous to the design, and consideration of possible additions and deletions that would make the assembled data statistically more workable.

As a result of the conference to revise the instrument, the following recommendations were effected in the questionnaire:

1. The personal data section was expanded by adding an item designed to secure information as to how

long the subject had resided in the community in which the planetarium functioned as an agency of adult education.

2. An unsupported hypothesis from the pilot study was corrected by adding a frequency of exposure item to that section that had been used to determine the effectiveness of newspaper publicity.

3. The attitude continuum that had been used in the pilot study was simplified in order to obtain a more accurate representation of differences regarding government expenditures on the space program. The original ten positions on the continuum were reduced to seven, thereby, theoretically, providing the respondent with a more meaningful choice on the attitude scale.

Selection of Frame and Sampling Units:

The selection of the individuals who would participate in the final phase of the investigation was made from a comprehensive list of adult and community education courses conducted in Flint, Michigan, during the winter semester by the Mott Education and Recreation Program. The list of classes from which the ultimate selection was made appeared as a supplement in the Flint Journal on January 3, 1965.

Several limiting considerations were made in the selection of the specific classes used in the study. First, classes were considered only if they seemed to contain subject matter that would seem to appear attractive to the average community adult. Second, classes selected were limited on the basis of their stated objectives. For example, classes offered for high school and university credit were eliminated since it was felt that they would reflect a biased sampling of the community. Third, and for similar reasons, all classes in adult education predicated on a scientific, mathematical or technological interest were eliminated from consideration. Classes considered to be primarily skill-oriented were retained since they could be considered to be either vocational or avocational. Fourth, those classes designed to specifically assist in the rehabilitation of the handicapped were also eliminated from consideration since it was felt that these classes dealt with materials too specific to be related to the interests of the average adult in Flint, Michigan.

After each of these limitations had been employed to narrow the size of the potential sampling universe, there still remained a total of two hundred and eleven classes in which one might reasonably expect to find the average adult of the community. In spite of the restrictions imposed on the size of the potential population of the study, the remaining two hundred and eleven classes in adult and community education represented a total of thirteen specific areas of the adult education curriculum.

In order to minimize the possible error in the sampling procedure it was necessary to make several assumptions. It was necessary to assume, first, that the limitations previously discussed did not violate the original intention of the research to locate the average community adult. It was then necessary to make a further assumption as to the number of completed returns in order to present an adequate testing sample. In order to accomplish this objective, and in light of the fact that the sampling error, other considerations held constant, is inversely proportional to the number of units comprising the sample, it was estimated that approximately one hundred responses should provide adequate data for the generalizations to be made.

The question as to how many classes would have to be surveyed in order to provide adequate data was also based on an assumption of numbers. It was assumed that the average class would contain approximately fifteen students. Therefore, a random sampling of seven classes would provide a minimum number of desired responses, while a random sampling of eight or more classes would, it seemed, most certainly provide adequate data for the study.

A common situation that exists in the scheduling of adult education courses, more prevalent in the winter months than at any other time of year, is that the mortality rate for the proposed courses is often quite high. Although no firm rule is employed by the Mott Program, it is generally assumed that a class will be discontinued unless eight or more people enroll. Therefore, this anticipated mortality

rate was considered in the selection of the unit samples comprising the experimental population, and the sample selection was expanded to encompass more potential responses than would actually be necessary in the analysis of data.

The names of each of the two hundred and eleven classes in the sampling universe were written on individual cards and deposited in a common container. The cards were carefully shuffled, each card was drawn, noted, and returned to the sample before the next drawing was made. In all a total of ten classes were selected to participate in this study to determine the effectiveness of planetarium education. The following is a list of the selected classes, their curriculum designation, and their disposition in the study. The classes are listed in the order of their selection.

TABLE II. SELECTED CLASSES, CURRICULUM DESIGNATION AND DISPOSITION OF THE CLASSES USED IN THE STUDY.

| Name of Class | | Curriculum Area | Disposition |
|---|---|---|---|
| 1. | Furniture Upholstering | Mechanical Skills | Included |
| 2. | Enjoying Good Literature | Speech and Drama | Not Included |
| 3. | Class Accordian | Music | Included |
| 4. | China Painting | Arts and Crafts | Included |
| 5. | Leather Craft | Arts and Crafts | Included |
| 6. | Beginning Carburation | Trades and Industry | Not Included |
| 7. | Transistors | Mechanical Skills | Included |

TABLE II. (Continued.)

| Name of Class | Curriculum Area | Disposition |
|---|---|---|
| 8. Graphics | Mechanical Skills | Included |
| 9. Double Knits | Bishop Sewing | Included |
| 10. Square Dance | Recreation Skills | Included |

The disposition column indicates that two of the ten selections were not included in the final assembly of data. Enjoying Good Literature was not included in the study because the class was cancelled due to insufficient enrollment while Beginning Carburation was discarded due to an administrative decision that no one class should be asked to participate in more than one research project during a single semester. The data, then, were collected from the remaining adult education classes. These classes represented a relatively wide spectrum of curriculum since they were representative of six of the thirteen curriculum areas of the original sample universe.

Method of Procedure:

In January of 1965, a conference was arranged with the representatives of the Mott Program in order to outline the purpose of the investigation and to formulate a method of approach that would provide for a maximum of cooperation with the least amount of interruption to the instructional processes. The following recommendations were made concerning the procedure to be followed:

1. Area coordinators should be contacted in order that

they might alert the instructor that his group had been selected to participate in the study.

2. The contact between the investigator and the instructor would be made either by letter or by telephone following the initial contact by the area coordinator.

3. Questionnaires would then be distributed to instructors for distribution among class members.

4. Follow-up procedure should be left up to the discretion of the investigator and determined by the promptness and completeness of returns.

Due to the failure of the units involved in the testing sample, and more specifically to the nature of the individuals involved in the testing sample, it was felt that the method as to how the questionnaire was to be completed, excepting of course, for the instructions included in the personal data section, should be a decision made by each instructor. Further, it was decided that no insistence should be made if the adult student registered an objection to filling out the questionnaire. Although this consideration could conceivably influence the number of completed returns, it is, as pointed out by Barr, Davis, and Johnson, wise to remember that valid and reliable information is obtained only if the respondents are able and willing to cooperate.[1] The problem

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1. Barr, Avril S., Davis, Robert A., and Johnson, Palmer O. Educational Research and Appraisal, (New York: J. B. Lippincott Company, 1953), page 169.

of incomplete returns offered no serious objection to the reliability of the research since the research dealt not with an analysis of class units but with the individuals comprising those units.

A General Analysis of the Population:

The total adult student population included in the eight classes selected for the final phase of the investigation was one hundred twenty. Due to the method of approach as it had been decided upon by administrators and teachers in the adult education program, there was, as to be expected, a certain percentage of students who did not return the completed questionnaire. Although one hundred twenty questionnaires were distributed, only one hundred seven were returned for data tabulation. This number represented a return value of 89.16 per cent of the total sample population.

The nature of the sample population evidenced one difference that was most noticeable when compared to the sample population that had been involved in the pilot study. Whereas the average educational level of respondents in the pilot study had been almost at the college graduate level, the average educational level of those involved in the final study had dropped to 12.4 years, a reduction that more closely approximated the average adult level of the city of Flint.

The population represented an excellent cross-section of the community adult in regard to the ages of those involved in the study. Only seven per cent of those studied fell in the age classification of fourteen through twenty-four, and six per cent fell in the classification listed as over sixty-five. The remaining per cent of the sample was divided so that fifty-one per cent were located in the age group between twenty-five and forty-four while the remaining age category of forty-five through sixty-five.

The general analysis of population revealed that even though the age category seemed to reflect a good cross-sectioning of the adult population, the length of time in which the participant had resided in the community seemed to be unexpectedly long. Only six of the total population had lived in the city of Flint for less than five years. The arithmetic mean for residing in the community was computed to be 27.27 years.

Statistical Treatment of the Data in the Study:

Several statistical methods were used to analyze the data collected from this study. In every instance caution was exercised so that different statistical treatments were not used to analyze responses where a comparison between divisions of the questionnaire would seem desirable.

The design employed in the study resulted in sub-populations that were of uneven ends or numbers. Although any of several methods might have been used to analyze the data, it was felt that the use of Fisher's "t" distribution was the most versatile and would lend itself best to the interpretation of data collected from those questions designed to measure specific differences in medium habits. Therefore, all medium analysis, with the exception of newspaper reading frequency, were made in accordance with the terms of the "t" test of significance.

The method of determining the standard error of the differences between percentages was substituted in newspaper reading frequency simply because the responses were clustered too close to the mean. Although theoretically the figures remain unchanged in the exchange of squares and square roots in a formula, this is true only when dealing with whole numbers. When methods such as the "t" test are used where fractional numbers are dominant, they serve to invalidate the findings.

The statistical method for conducting an analysis of variance was employed to analyze the data relating to aspects of attitude response. The writer chose to employ this particular method since it was not necessary that precise measurements of difference be obtained, but only that sufficient evidence be found as to whether differences existed among the adults assigned to the different groups.

In analyzing the responses to that section of the questionnaire dealing with vocabulary recognition it was once again necessary to arrive at a precise estimate of statistical probability. Since the numbers of adults involved were smaller than those used in the analysis of media habits, the method of using a theoretical infinity to even the numbers was impractical. Therefore, it was necessary to select a method of analysis where the numbers in the sub-samples were of secondary importance in determining significance. Because of these considerations, the method of analysis selected was one which would estimate the standard error of difference between two uncorrelated means.

<u>A Specific Analysis of Media Habits as Related to Adults Who Attend Planetariums and Adults Who Do Not:</u>

The planetarium as an agency for adult education cannot fulfill its obligations unless it continually seeks to inform the public in the most effective manner. This requires, not only the technical skills to meet the requirements of each particular medium, but also an understanding as to which medium would, according to the laws of probability, have a maximum chance of reaching those adults in the planetarium community who would be most likely to participate in this type of science programming.

The questionnaire used in the experiment was, in part, designed to isolate and measure the potential effectiveness of various forms of communication. This measurement took the form of four questions designed to provide data pertinent to the discovery of the general media habits of a typical adult population. These four general categories were: (1) the number of hours per week spent in viewing television, (2) the number of hours per week spent in listening to the radio, (3) the number of novels read during the past year,

and (4) the number of movies attended during the past year. All of these media items were specified as an estimated item.

Specifically, the raw data were grouped into two columns of uneven ends, one column representing planetarium visitors and the other representing planetarium non-visitors. This represented a departure from the pilot study where the creation of sub-groups had been accomplished on the basis of sex differences.

Each general media factor was thus subjected to a statistical analysis based on a formula advanced by Lester Guest.[2] The formula, then, being applied to each of the two groups in each of the four media questions was able to provide a statistically accurate appraisal of the differences existing between those who attend the planetarium programs and thos who do not.

TABLE III. COMPARISON OF DIFFERENCES IN MEDIA EXPOSURE FREQUENCY BETWEEN THOSE ADULTS WHO ATTEND PLANETARIUM PROGRAMS AND THOSE WHO DO NOT.

| Media | Visitors | SD | Non-Visitors | SD | t | p |
|---|---|---|---|---|---|---|
| Television | 11.09 | 9.26 | 14.50 | 9.99 | 1.78 | n.s. |
| Radio | 8.41 | 10.90 | 10.91 | 13.37 | 1.06 | n.s. |
| Novels | 6.67 | 8.73 | 7.46 | 12.54 | 3.70 | $<.01$ |
| Movies | 6.00 | 6.18 | 3.86 | 5.69 | 1.78 | n.s. |

The results of the investigation revealed only one area in which the two groups demonstrated a statistically signifi-

2 Guest, Lester. Beginning Statistics, (New York: Thomas Y. Crowell Company, 1957), page 187.

cant difference. However, a closer examination of the data reveals several interesting tendencies. At a level slightly higher than the .05 level of probability the data reveal a habit pattern that might prove valuable in reaching a larger number of receptive adults. For example, there is a tendency for those adults who attend planetarium programs to go to more movies but to watch fewer television program than for those who do not attend planetarium programs.

This division of the study was conducted with forty-four adults comprising the sub-group designated as those who attend planetarium programs and fifty-eight adults designated as non-visitors. Although statistically, the ends were evened at infinity, numbers exceeding thirty, it is apparent that an insight into the tendencies of the media habits of adults becomes more important as the base of population is increased.

The general analysis of population as it related to sex differences demonstrated that the group was relatively evenly divided. The total sample contained fifty males and fifty-seven females.

The last medium to be investigated in this study was designed to determine the habits of communication as they relate to the reading of the daily newspaper. Question four was designed to determine a frequency of reading habits as separated into the two general categories of those who attend planetarium programs and those who do not. A total of forty-four visitors answered the question at a mean level of 6.45 times per week, while a total of sixty planetarium non-visitors answered the question at a mean level of 6.22.

Since the data in each of the samples were so closely clustered at the mean it was decided to analyze the data in terms of percentages rather than to analyze the data, as had been done in previous analyses, according to the standard deviation of the means.

A total of thirty-five of the forty-four planetarium visitors replied that they read a newspaper each day, while a total of forty-two of the sixty non-visitors replied that they read a newspaper daily. Since a population of uneven ends is again being dealt with, it is not possible to assign percentages of eighty and seventy to the respective populations. Rather, in order to make the data statistically manageable, an~~d~~ average percentage must be derived as the best estimate of statistical truth.

A computation of data in terms of the formula[3]

$$\sigma \text{diff.} \quad \% = \frac{p1 \quad q1}{N_1} + \frac{p2 \quad q2}{N_2}$$

computed at 6.56 per cent as the standard error of the differences between percentages if the true percentages of each group were 87.50. The formula for determining the level of

3 Guest, op.cit., pp. 189ff.

significance in this type of calculation is $\frac{\text{diff.}}{\sigma \text{diff.}}$ or ten per cent (80-70) divided by the derived percentage of 6.56. The final extrapolation provides us with a probability of difference level greater than .1 but less than .05.

The second aspect of the study was designed to determine the extent to which differences in reading order preferences might exist between the two populations under consideration.

The results of the pilot study were borne out in the final phase of the investigation in that the number of "no answers" increased appreciably in this section of the questionnaire. Only seventy-two of the potential responding population assigned specific weights to all six of the categories. Table IV represents the composite weights assigned to each category and the corresponding rank of each category as separated according to planetarium visitors and non-visitors.

TABLE IV. NEWSPAPER READING ORDER PREFERENCES.

| Planetarium Visitors | | Planetarium Non-Visitors | |
|---|---|---|---|
| Section | Rank | Section | Rank |
| Sports | 4 | Sports | 3 |
| Classified | 5 | Classified | 5 |
| Feature | 1 | Feature | 1 |
| Social | 3 | Social | 4 |
| Editorial | 2 | Editorial | 2 |
| Comics | 6 | Comics | 6 |

Another objective of the research was to discover to what extent a relationship existed between groups that might be referred to as a cross-cultural relationship. In other words, the question posed by the research was: Does an adult who attends planetarium programs also attend art exhibits and stage productions, or are aspects of one cultural expression separate and distinct from aspects of other cultural participation?

In order to answer this question posed by the research, a tabulation was made of the responses to Questions Eight, Nine and Ten on the evaluative instrument. Since a constant was introduced into each of the three questions, that of some type of cultural participation, the result was the creation of a sub-sample in which sixty-nine raw scores were allowed to function dependently in a total cross-cultural analysis.

The form in which the analysis was developed consisted of three categories with four factors each.

A. People who attend the planetarium -

f1: planetarium visitors who attend nothing else.
f2: planetarium visitors who attend only the theater.
f3: planetarium visitors who attend only the art center.
f4: planetarium visitors who attend both the theater and the art center.

B. People who attend theater productions -

f1: theater visitors who attend nothing else.
f2: theater visitors who attend only the planetarium.
f3: theater visitors who attend only the art center.
f4: theater visitors who attend both the art center and the planetarium.

C. People who attend the art center -

f1: art center visitors who attend nothing else.
f2: art center visitors who attend only the planetarium.
f3: art center visitors who attend only the theater.
f4: art center visitors who attend both the theater and the planetarium.

TABLE V. AN ANALYSIS OF CROSS-CULTURAL RESPONSES EXPRESSED IN TOTALS AND PERCENTAGES.

| | Group A | | Group B | | Group C | |
|---|---|---|---|---|---|---|
| | Total | Percentage | Total | Percentage | Total | Percentage |
| f1 | 6 | 42.86 | 4 | 14.91 | 4 | 14.29 |
| f2 | 1 | 07.14 | 2 | 07.14 | 0 | 00.00 |
| f3 | 0 | 00.00 | 14 | 51.95 | 17 | 60.71 |
| f4 | 7 | 50.00 | 7 | 26.00 | 7 | 25.00 |

The number of actual responses in each category is projected in the column marked "total," while the percentage, representing the degree of response in each factor as compared to the total of the group, is listed directly opposite. An analysis of variance need not be conducted of the data in order to see the differences that exist between these groups. The differences between the groups were especially apparent at comparison points f1, f3, and f4.

Question Eleven was designed to measure the attitude of the population as it related to large government expenditures made for the purpose of furthering space research. Since one of the functions inherent in planetarium programming is that of informing the community adult with the immediate objectives and long range goals of such research, it was postulated that, assuming planetarium programming is effectively conducted, such an acquaintance with purposes should produce a noticeable difference in attitude between those who attend planetariums and those who do not.

As is the case in any social research, not all operating variables can be isolated and controlled during any given experiment. Therefore, in the analysis of response to Question Eleven, it was decided to determine the attitude from three separate but related variables: age, sex, and planetarium attendance.

In order to determine if age was a factor operating in the formation of attitude in the adult concerning expenditures for space research, the data were subjected to an analysis of variance. The method of analysis of the data for Table VI is presented in the form suggested by Dixon and Massey.[4]

TABLE VI. ANALYSIS OF VARIANCE OF AGE AS A FACTOR IN ATTITUDE FORMATION.

| | Sum of Square | df | Mean Square | F ratio |
|---|---|---|---|---|
| Category Means | 579.00 | 2 | 289.50 | F = 18.38 |
| Within | 141.00 | 8 | 15.75 | $F_{.95}$ (2,8) |
| | 720.00 | 10 | | 4.46 |

4 Dixon and Massey, <u>op.cit.</u>, page 150.

As evidenced by the manipulation of data in the preceding table, the observed value of F (18.38) lies far outside the selected $F_{.95}$ (4.46); therefore, we are forced to reject the hypothesis that the age of the respondent is not an appreciable factor in the formation of attitude.

A total of one hundred responses were next tabulated according to sex and attitude. The two sample populations were almost evenly divided with forty-eight males replying and fifty-two females. An analysis of variance was conducted on the observed data and produced the following computations and statistical values.

TABLE VII. ANALYSIS OF VARIANCE RELATING SEX TO ATTITUDE.

| | Sum of Square | df | Mean Square | F ratio |
|---|---|---|---|---|
| Category Means | 740.91 | 2 | 370.45 | F = 2.54 |
| Within | 582.00 | 4 | 145.50 | $F_{.95}$ (2,4) |
| | 1322.91 | 6 | | 6.94 |

The final manipulation of the data collected from Question Eleven was designed to determine to what extent planetarium attendance acted as a causal agent in influencing the attitude of adults. In order to test the hypothesis that the degree of attendance did make a difference, the population was divided into three sub-samples rather than two.

Computations of the data produced a category means of 683.33 with two degrees of freedom. The data also produced a sum within the individual squares of 160.67 with six degrees of freedom. The observed F computed from these values was 12.76. Entering the F table at a .99 level of confidence, a value of 10.9 was obtained. Since the observed F is greater than the statistical F, it is reasonable to assume that the degree to which an adult participates in planetarium programming does make a difference in the attitude toward government expenditures in space research.

Question Twelve attempted to determine if planetarium attendance would provide the participating adult with a vocabulary recognition level that would prove functional in interpreting the rapidly developing events in space research and technology.

In order to provide an answer to the question posed by the research, a tabulation of the scores made by subjects who had attended planetarium programs only once were compared with the scores of those subjects who had attended the planetarium programs two or more times. Although, for the sake of statistical manipulation, a null hypothesis was assumed between means, it was surmised that if the multiplicity of this type of adult education experience were a factor in building a functional vocabulary, it would show up in an analysis of the difference of the means.

In analyzing the data in Table VIII it was desired to make an estimate of the difference between two uncorrelated means. Garrett has provided the formula

$$\sigma D = \sqrt{\sigma^2 M_1 + \sigma^2 M_2}$$

which can be used for interpreting the previous data.[5]

TABLE VIII. SINGLE AND MULTIPLE PLANETARIUM EXPERIENCES AS RELATED TO VOCABULARY RECOGNITION

| SA | x | $x^2$ | MA | x | $x^2$ |
|---|---|---|---|---|---|
| 22 | +6.00 | 36.00 | 25 | +7.08 | 50.13 |
| 22 | +6.00 | 36.00 | 24 | +6.08 | 36.97 |
| 21 | +5.00 | 25.00 | 23 | +5.08 | 25.81 |
| 20 | +4.00 | 16.00 | 22 | +4.08 | 16.65 |
| 20 | +4.00 | 16.00 | 18 | + .08 | .01 |
| 19 | +3.00 | 9.00 | 17 | - .91 | .83 |
| 19 | +3.00 | 9.00 | 17 | - .91 | .83 |
| 18 | +2.00 | 4.00 | 16 | -1.91 | 3.65 |
| 17 | +1.00 | 1.00 | 14 | -3.91 | 15.29 |
| 17 | +1.00 | 1.00 | 11 | -6.91 | 47.75 |
| 15 | -1.00 | 1.00 | 10 | -7.91 | 62.57 |
| 15 | -1.00 | 1.00 | | | |
| 14 | -2.00 | 4.00 | | | |
| 13 | -3.00 | 9.00 | | | |
| 12 | -4.00 | 16.00 | | | |
| 11 | -5.00 | 25.00 | | | |
| 11 | -5.00 | 25.00 | | | |
| 11 | -5.00 | 25.00 | | | |
| 7 | -9.00 | 81.00 | | | |

[5] Garrett, Henry E. Statistics in Psychology and Education, (New York: Longman's, Green and Company, 1941), p. 211.

Extrapolating from the data we find the difference between the two observed means is 1.91, but in order to assess a level of significance it is first necessary to calculate the reliability of the difference between the means. The standard difference of mean 1 is $\frac{17.89}{\sqrt{19}}$ while the difference of mean 2 is $\frac{21.71}{\sqrt{12}}$. After this computation had been completed the two remaining values were 4.10 and 6.27. Substituting these standard errors in the formula produced a factor of 7.49. Interpretation of this value proves to be highly significant at a level greater than a 99.9 level of confidence.

It was suspected that a factor other than planetarium attendance might be operating to produce the significant results obtained from the data in Table VIII. The two groups were compared then as to educational level and it was found that those subjects classified as multiple attenders had an educational mean level of 13.43 years as compared to an educational mean level of 12.27 years for single attending subjects.

In order to verify the extent to which educational level functioned in the conclusions, another pairing of subjects was made from the total experimental population. Here two groups were established, one composed of attenders and one of non-attenders. No separation was made as to the number of frequency of planetarium experience. Instead, the selection was made with consideration as to the last grade of

formal schooling completed. No subject was selected who had not completed at least fourteen years of education.

TABLE IX. PLANETARIUM ATTENDERS AND NON-ATTENDERS AS RELATED TO VOCABULARY RECOGNITION.

| NA | x | $x^2$ | A | x | $x^2$ |
|---|---|---|---|---|---|
| 22 | +5.24 | 27.46 | 24 | +6.62 | 43.82 |
| 20 | +3.24 | 10.50 | 23 | +5.62 | 31.58 |
| 20 | +3.24 | 10.50 | 21 | +3.62 | 13.10 |
| 20 | +3.24 | 10.50 | 19 | +1.62 | 2.62 |
| 18 | +1.24 | 1.54 | 19 | +1.62 | 2.62 |
| 18 | +1.24 | 1.54 | 18 | + .62 | .38 |
| 17 | + .24 | .06 | 17 | - .38 | .14 |
| 17 | + .24 | .06 | 17 | - .38 | .14 |
| 16 | - .76 | .58 | 16 | -1.38 | 1.90 |
| 16 | - .76 | .58 | 15 | -2.38 | 5.66 |
| 13 | -3.76 | 14.14 | 15 | -2.38 | 5.66 |
| 12 | -4.76 | 22.66 | 14 | -3.38 | 11.42 |
| 9 | -7.76 | 60.22 | 8 | -9.38 | 87.98 |

The difference between the two observed means in the table is .62; 16.76 for non-attenders and 17.38 for attenders. Computing the data according to the formula used in the previous table, a factor of 5.58 is derived as the standard estimate of difference between the two means. The value again is significant at a level greater than 99.9.

# CHAPTER VII

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary:

The purpose of this study was to provide some basic insights into the problem of programming planetariums in order to better meet the needs of adults in the communities which they serve. Planetariums, formerly a rarity on the American scene of science education, have proliferated to a point where few citizens are geographically beyond their sphere of influence. Yet, in spite of the great proliferation that has occured here in the last part of the twentieth century, little has actually been explained as to the reasons for its success. Too many who bear the responsibility for effective planetarium programming do so by "rule of thumb" with little or no facts to use as guides.

Generally, the study was undertaken with two basic purposes in mind: first, to provide a series of unbiased measurements of the product itself; that is, to determine the effect of this type of science education on adults who participate in it; and second, to mark out more clearly than has been done, the manner in which a planetarium director or programmer might better inform his adult public as to periodic changes in public programs and special classes being offered in astronomy and its related sciences.

Specifically, it was hypothesized that if planetariums are to function effectively then they must transmit the knowledge of astronomy over the broadest popular base. Consequently, the design for the study undertaken in Flint, Michigan, attempted to determine the best means of dissiminating information through an analysis of media habits of adults. The study also attempted to gather some selected information about the adults themselves in order that programs might be made to better fit them in presentation, content, and supporting effects.

It was further hypothesized in the study that planetarium education, if considered a worthwhile educational experience, would have to possess the potential of providing the adult with both a practical space age vocabulary so that he might interpret correctly the information he receives, and, an attitude set, encouraged through a better understanding and appreciation of current scientific achievements, that would in turn make him more receptive to understanding the great changes about him. We could, therefore, think of this concept as both circular and self-reinforcing. The adult is provided more information through participation in planetarium programs; his attitude is changed because of his exposure to information of better quality and in greater amounts; and, because his attitude has been changed, he becomes more knowledgeable about the subject. One of the basic purposes of the study then was to determine if the planetarium experience is really capable of producing this kind of change in the adult.

Conclusions and Recommendations:

The individual responsible for planetarium programming, as with most employees of educational institutions, finds himself operating in a situation where neither budget nor staff will permit him to be wasteful of the resources at his disposal. His cooperation must be extended to those institutions and agencies where mutual expenditures of time and money can provide maximum benefits for both cooperating parties.

The findings of this research as summarized in Chapter VI indicate that when choices of this kind are made it would be wise to make them in favor of such forms of communication as newspapers and motion picture theaters. It is here, according to the findings of this study, that the planetarium programmer can expect the best return for his investment. Although the findings indicate significant negative relationships between planetarium attenders and users of libraries this does not mean that the planetarium programmer should avoid cooperating with the local libraries serving the planetarium community. On the contrary, when a surplus of funds and staff time can be found, he should approach such cooperation with a sense of challenge, trying to interest those adults who ordinarily would not be likely to avail themselves of the type of education offered by planetariums.

The findings of the research also provided some basic insights into the type of adult who attended planetarium

programs. For one thing, it was discovered that the formal educational level of adults attending planetarium programs was generally higher than the educational level for adults who did not attend the programs. Such knowledge, if it can be extended to a wider universe than that encompassed by this specific study, would indicate that the typical planetarium program can be upgraded in both thought and presentation without seriously affecting the audience's understanding of its content.

A tabulation of responses also indicated that adults who attended planetarium programs were not the same adults who attended art centers and theaters even when these forms of culture were located adjacent to the planetarium itself. In other words, the research revealed no indication of a "cultural cross-over" even when it was convenient that such a transition between the arts and the sciences could be made. It would seem, therefore, that package advertising, where the activities of several institutions are publicized collectively, would best be restricted to institutions that are considered similar by participating adults.

The planetarium director or programmer, it would seem, would need have no reluctance to promote the effectiveness of the medium with which he works. Both the hypothesis concerning vocabulary recognition and attitude were substantiated by the statistical findings expressed in the previous chapter. Not only does the planetarium experience provide

the participating adult with a functional vocabulary for interpreting scientific happenings of consequence, but also the planetarium experience would seem to condition the attitude of the adult, causing him to place the accumulation of new scientific knowledge above the personal expense he must bear to support the space program.

Concluding Statement:

The conclusions drawn from the analysis of data collected for this study might lead us to generalize to populations where the conclusions might prove invalid. It would appear desirable, therefore, to conduct similar studies in dissimilar communities where habits and responses of adults might conceivably be different from those who participated in this study. Until such cooperative research is conducted by other major planetariums, and until such similarities and differences as might exist are identified, it would be well to view even the highly significant results obtained from this study with some skepticism if they are generalized to too dissimilar populations.

Corroborative research is also needed to verify the findings of this study in still another way. Others of the major planetariums should conduct similar qualitative investigations of their adult attenders using a pre-test, post-test statistical design. In a study such as this where participating and non-participating adults are selected from a random population, it is often easy to reverse the essential roles played by cause and effect. Further studies using the pre-test, post-test method would serve to identify conclusively the function of these two factors in the research.

The author makes no claim that this research has provided all the answers to all the questions that plague those who make decisions on planetarium programming; it has been, at best, a beginning, an attempt to discover relationships that heretofore have been undiscovered. As John H. Thatcher has said, "no administrator can be effective unless he has an understanding of the adults who make up his student body and, just as important, those in his community who are not in his adult education program."[1]

The data for this study have provided us with the foundations for that kind of understanding. Emerging from this study is the recognition of attitudes and behavior patterns that will ultimately assist planetarium directors in making better decisions regarding programming as it relates to the needs of the adult in our contemporary society.

But — WHAT [illegible]?

---

[1] Thatcher, John H. Public School Adult Education, A Guide for Administrators, (Albany, New York: Public National Association of Public School Adult Educators, 1963), page 111.

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# AND

# APPENDICES

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## APPENDIX I

## THE COVER LETTER

Dear ________:

I am presently conducting some community research in which your help would be most valuable. As an instructor for the Mott class in Furniture Upholstery that meets at Cody School on Monday nights. I would appreciate it if you would distribute the questionnaires enclosed to the members of your class, have them fill them out and return them to you, and then simply drop them in the school mail in order that they might be returned to me for tabulation.

I have checked with the area coordinator, and he tells me there are sixteen people enrolled in the class. I am, therefore, enclosing seventeen copies of the questionnaire along with the return envelope.

Your cooperation in this matter would be greatly appreciated.

Very sincerely yours,

Maurice G. Moore

# APPENDIX II

## THE PILOT STUDY QUESTIONNAIRE

We are in the process of collecting information which will enable us to better evaluate the work we are doing in community science education with adults.

It is not necessary that you sign the questionnaire after you have completed it, but it would be helpful to us if you would complete the items and return them to us at your earliest convenience.

Maurice Gene Moore
Director

ROBERT T. LONGWAY PLANETARIUM

Personal Data

Please check the correct items listed below:

Sex: M ____

F ____

Age: 14-24 ____

25-44 ____

45-65 ____

Over 65 ____

Education: Please list by year the last year of formal education completed. For example, a high school graduate would list 12, while a college graduate would list 16.

Number of years completed: ______

1. How many hours a week would you estimate you spend viewing television? ________

2. How many hours a week would you estimate you spend listening to the radio? (Include incidental listening and listening while driving.) ________

3. How many novels would you estimate you have read during the past year? ________

4. Please list in the order you usually read your newspaper. Let "1" stand for the section you usually read first.

| | | |
|---|---|---|
| Sports ____ | Feature ____ | Editorial ____ |
| Classified ____ | Social ____ | Comics ____ |

5. How many movies have you attended during the past year? ______

6. How many times have you attended programs at the Robert T. Longway Planetarium? List total number. ______

7. How many times have you attended public programs at the planetarium during the past year? ______

8. How many times have you attended plays at the Bower Theater during the past year? ________

9. How many times have you attended special showings at the DeWaters Art Institute during the past year? _____

10. Government expenditures have continued to rise in an effort to allow the United States to explore the moon and planets. Do you feel this program is:

/ 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 /

| completely unjustified | no opinion | completely justified |
|---|---|---|

Please mark an X over the position that most closely represents your personal opinion in the above scale.

11. Supposing the following words were to come up in a conversation. Would you feel you understood their meaning?

| | Yes | No |
|---|---|---|
| Absolute temperature | ___ | ___ |
| Blockhouse | ___ | ___ |

| | Yes | No |
|---|---|---|
| Cavitation | ___ | ___ |
| Celestial sphere | ___ | ___ |
| Communication satillite | ___ | ___ |
| Complex | ___ | ___ |
| Console | ___ | ___ |
| Control Rocket | ___ | ___ |
| Dysbarism | ___ | ___ |
| Gamma Ray | ___ | ___ |
| Geomagnetism | ___ | ___ |
| Gravitation | ___ | ___ |
| Launch Ring | ___ | ___ |
| Micrometeorite | ___ | ___ |
| Payload | ___ | ___ |
| Pip | ___ | ___ |
| Procession | ___ | ___ |
| Reaction | ___ | ___ |
| Control System | ___ | ___ |
| Rendezvous | ___ | ___ |
| Space Craft | ___ | ___ |
| Subatomic Particle | ___ | ___ |
| Tektite | ___ | ___ |
| Topside Sounder | ___ | ___ |
| Whistler | ___ | ___ |

## APPENDIX III

## THE QUESTIONNAIRE

We are in the process of collecting information which will enable us to better evaluate the work we are doing in community science education with adults.

It is not necessary that you sign the questionnaire after you have completed it, but it would be helpful to us if you would complete the items and return them to your instructor at your earliest convenience.

ROBERT T. LONGWAY PLANETARIUM

PERSONAL DATA

Please check the correct items listed below:

Sex: M ____

F ____

Age: 14 - 24 ____

25 - 44 ____

45 - 65 ____

Over 65 ____

How long have you lived in the Flint Community? (Please estimate to the nearest one-half year.) ____________

Education: Please list by year the last year of formal education completed. For example, a high school graduate would list 12, while a college graduate would list 16.

Number of years completed: ______

# QUESTIONNAIRE

1. How many hours a week would you estimate you spend viewing television? ______

2. How many hours a week would you estimate you spend listening to the radio? Include incidental listening and listening while driving. ______

3. How many novels would you estimate you have read during the past year? ______

4. How many days of the week would you estimate you read a daily newspaper? ______

5. Please list in the order you usually read your newspaper. Let "1" stand for the section you usually read first.

   | | | |
   |---|---|---|
   | Sports ____ | Feature ____ | Editorial ____ |
   | Classified ____ | Social ____ | Comics ____ |

6. How many movies have you attended during the past year?

   ______

7. How many times have you attended programs at the Robert T. Longway Planetarium? List total number: ______

8. How many times have you attended public programs at the planetarium during the past year? ______

9. How many times have you attended plays at the Bower Theater during the past year? ______

10. How many times have you attended special showings at the DeWaters Art Institute during the past year? ______

11. Government expenditures have continued to rise in an effort to allow the United States to explore the moon and the planets. Do you feel this program is:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Completely Unjustified | | | | No Opinion | | | | | Completely Justified |

Please mark an X over the position that most closely represents your personal opinion in the above scale.

12. Supposing the following words were to come up in a conversation. Would you feel you understood their meaning?

| | Yes | No |
|---|---|---|
| Absolute temperature | ___ | ___ |
| Blockhouse | ___ | ___ |
| Cavitation | ___ | ___ |
| Celestial Sphere | ___ | ___ |
| Communication Satillite | ___ | ___ |
| Complex | ___ | ___ |
| Console | ___ | ___ |
| Control Rocket | ___ | ___ |
| Dysbarism | ___ | ___ |
| Gamma Ray | ___ | ___ |
| Geomagnetism | ___ | ___ |
| Gravitation | ___ | ___ |

| | Yes | No |
|---|---|---|
| Launch Ring | ___ | ___ |
| Micrometeorite | ___ | ___ |
| Payload | ___ | ___ |
| Pip | ___ | ___ |
| Procession | ___ | ___ |
| Reaction | ___ | ___ |
| Control System | ___ | ___ |
| Rendezvous | ___ | ___ |
| Space Craft | ___ | ___ |
| Subatomic Particle | ___ | ___ |
| Tektite | ___ | ___ |
| Topside Sounder | ___ | ___ |
| Whistler | ___ | ___ |

## APPENDIX IV

### SUMMARY OF VITAL DATA APPLYING TO EXISTING MAJOR PLANETARIUMS

| Planetarium | Diameter of Dome | Projection Instrument | Seating Capacity |
|---|---|---|---|
| Adler, Chicago, Ill. | 68 ft. | Zeiss II (modernized) | 496 |
| Air Force Academy Colorado Springs, Colorado | 50 ft. | Spitz B | 288 |
| American Museum Hayden, New York | 75 ft. | Zeiss IV | 814 |
| Buhl Pittsburgh, Pa. | 65 ft. | Zeiss II | 490 |
| Charles Hayden Boston, Mass. | 60 ft. | Korkosz | 276 |
| Fels Philadelphia, Pa. | 65 ft. | Zeiss IV | 500 |
| Griffith Los Angeles, Cal. | 75 ft. | Zeiss II (new) | 450 |
| Longway Flint, Michigan | 60 ft. | Spitz B | 292 |
| Morehead Chapel Hill, North Carolina | 68 ft. | Zeiss II (modernized) | 471 |
| Morrison San Francisco, California | 65 ft. | California Academy of Science | 458 |
| St. Louis St. Louis, Mo. | 60 ft. | Goto L-1 | 408 |