In 1960 the American Museum-Hayden Planetarium reopening ceremonies were held to celebrate the installation of a new Zeiss projector. In addition to an unforgettable planetarium demonstration, each guest received a souvenir book by Helmut Werner called *From the Aratus Globe to the Zeiss Planetarium*. Werner quotes a 1927 statement by von Klüber from the “Die Naturwissenschaften”:

Finally it must again be strongly emphasized how important and, indeed, decisive it is for the achievement of all the tasks and aims set by the planetarium that the organization behind it ensures that the nature and style of the performances and lectures conform to the purpose of the instrument. Considerable pedagogic talent and experience are required to present this difficult material in a manner which is at once understandable, instructive and stimulating, so that every visitor to the planetarium—and the wide interest in astronomy suggests they will be many—follows it with ease and interest. Only when the whole idea of the planetarium is applied to purely educational and scientific purposes, and any suggestion of its being a sensational novelty is repudiated, will its cultural value be proven and its financial success substantiated.

The concept of the planetarium as an educational tool to demonstrate difficult natural phenomena was firmly established from the beginning. Thirty years separate von Klüber’s statement and Werner’s book published in 1957. Seventeen more years to the present find

NOTE: The author is a former guest lecturer of The American Museum-Hayden Planetarium.
these words as true as they were when few planetariums were in existence and educational application was on a rather limited scale.

THE TOTAL EDUCATIONAL PROGRAM

A planetarium educational program demands a staff with unique skills in astronomy and pedagogy. Every person involved in the design of programs and their presentation should possess professional competence in the subject matter, an understanding of the learning process, and the ability to teach effectively at all grade levels.

A person with all these qualifications is rare indeed. If a planetarium is large enough to support several professional persons, staff should be selected with these needs in mind. One way to solve the dilemma might be to record various programs, thus eliminating the need for a live lecturer. If a planetarium chooses not to design its own taped presentations, complete programs with audio tapes, slides, and special effects may be purchased.

I believe that although there are advantages in taping a program—the control of subject matter and special effects—only a live lecturer possesses the qualities necessary to provide true learning. A tape treats every audience the same, disregarding age, level of competence, or interest. Perhaps the best course to pursue would be a mixed program with the selection of taped subject matter and its presentation determined by the man and not the machine.

The total program may be categorized as follows:
2. School programs: elementary and secondary.
3. Teachers’ courses: in-service programs.
4. Off-campus courses: in cooperation with local universities.
5. Evening extension programs: adult avocational programs.

The total astronomy program of a planetarium is far more extensive than presently offered in any single educational institution. Care must therefore be exercised that each category be treated in terms of the educational needs of the participants. School programs should deal with the learning experiences of young people at a given grade level. In teachers’ courses, the competence of a teacher is not necessarily increased by a classroom lecture in astronomy or a sky show meant for the general public. However, a sky show may be quite appropriate for teachers and pupils if the public presentation is carefully planned for this purpose.

Each of the above categories of the total program is worthy of detailed treatment in separate articles. Therefore, this paper will be limited to planetarium programs designed for elementary and secondary schools.
FIELD TRIPS

A field trip is defined as an activity involving a class away from the school in connection with classwork. A trip to the planetarium may or may not be a field trip. Unless some correlation with classwork exists, the visit might be a class outing—a recreational activity. These activities are fine, but the planetarium does not meet its own objectives or community goals if its school visits are limited in scope. A class should not visit the planetarium merely because it has become a practice to take a trip. Measures are needed to ensure that the planetarium visit is truly a field trip with planned activities that relate to classroom work.

Field trips should provide firsthand experiences that arise from direct learning situations. The planetarium can offer such experiences by introducing demonstrations that take the observer outdoors and into space. In *Museums and Our Children*, Charles Russell quotes Charles G. Wilder, the former Director of the Kansas City Museum:

> At the Kansas City Museum we encourage classes to visit the museum and the planetarium with one purpose in mind, namely, to study the topic which they are studying in the classroom. We discourage, whenever possible, classes coming to tour the whole building or to just see a “star show.” This is a policy to which most of the teachers and school administrators the museum serves heartily subscribe. A museum has a unique contribution to make toward enriching the school curriculum, one which cannot in most cases be duplicated in the classroom.

THE SCHOOL SCIENCE PROGRAM AND THE PLANETARIUM

The correlation of a planetarium presentation with a science curriculum will differ according to grade level and the extent to which science is taught. In elementary schools through the sixth grade, the curriculum is not formalized, and implementation tends to be localized. Here communication between the planetarium and the school can encourage coordination and a common approach to curriculum development.

The early secondary-school science program (general science and earth science) has units dealing with astronomy. Usually late secondary-school science consists of unit courses in biology, chemistry, and physics. Modular and period systems in scheduling secondary classes make planetarium visits more difficult. Since astronomy is not a unit subject on this level of instruction, visits will be less frequent and difficult to justify. High-school students might be better served in special-interest programs, which can meet outside the regular school day.

Since 1960 several science projects have been developed for elementary schools. A planetarium program that meets its objectives in
serving the schools will include the approaches developed in these projects:

1. Elementary Science Study (ESS).
2. American Association for the Advancement of Science (AAAS) Program.
4. Elementary Science Project (ESP).
5. School Science Curriculum Project (SSCP).
6. Science Curriculum Improvement Study (SCIS).
7. Earth Science Curriculum Project (ESCP).

For example, one ESCP course, Earth's Environment in Space, consists of the following topics:

1. The Moon: A Natural Satellite.
2. The Solar System.
3. Stars and Other Suns.
5. The Universe and its Origin.

**THE CORRELATED PROGRAM**

Once the content of the school science curriculum is known, the planetarium program can be developed. The extent of the planetarium offerings at any particular grade level will depend on the number of topics for each grade level, the number of visits for each class per year, and the number of program changes per year.

At Port Chester, New York, each class from kindergarten through grade six makes five visits each year to the School District Planetarium, an A3-P Spitz planetarium instrument. Each eighth-grade pupil makes eight consecutive visits as part of the earth science curriculum. Programs change weekly for elementary classes and every eight weeks for junior high for a total of forty-three topics each school year.

A major planetarium in a museum may find a weekly change impractical and unnecessary. Unlike Port Chester, a class served by a large museum planetarium probably cannot make frequent visits. The major planetarium might offer nine programs each year. A monthly change in program provides three choices for primary, intermediate, and secondary levels of instruction.

In addition to national projects, planetarium programs should reflect the projects adopted by the local schools. Cities and states have bureaus of curriculum research that publish handbooks for use in the schools. These curriculum bulletins list objectives with suggestions for their implementation.
The New York State Elementary Science Syllabi contain the following objectives or purposes:

1. To learn about the relationship of the earth, sun, and moon.
2. To learn what the solar system is.
3. To learn about the composition of our solar system.
4. To learn about movements of bodies in space.
5. To learn about the relationship of the solar system to the universe beyond it.
6. To learn about the nature of the universe and how we obtain knowledge about it.

The correlated program of the Port Chester planetarium follows the New York State Syllabi. A suggested outline for topic 1 for elementary schools is as follows:

I. Purpose: To learn about the relationship of the earth, the sun, and the moon

II. Introduction of the unit
A. Motivating activities
   1. Make a bulletin board display showing some pictures of places and things on earth (mountains, lakes, forests, oceans, and clouds). Also display pictures of the sun and the surface of the moon.
   2. Show pictures of the earth that have been taken from satellites.
   3. Show pictures depicting the four seasons.
B. Motivating questions
   1. When can we see the moon?
   2. Does the moon always look the same?
   3. Is the earth as large as the sun?
   4. Is the moon as large as the earth?
   5. Is the moon or the sun nearer the earth?
   6. What is the shape of the earth?
   7. Is the air part of the earth?
C. Teacher-directed activities
   1. To show that the earth is round, exhibit a globe of the earth. Examine the land and water areas. Find our country.
   2. Talk about things children like to do in the spring, summer, autumn, and winter. How does the change in seasons affect their activity?
   3. Observe objects at a great distance. How do they appear when we move closer to them? The sun is larger than the earth, but because of its great distance, it looks smaller. The moon is much smaller than the sun but in
the sky they look the same size because the moon is closer to the earth.

4. When the moon is in the daytime sky, take the children outside to observe its position on successive days. Ask the children if the moon is in the sky at night when it is also visible during the day.

III. Planetarium visit

A. Demonstrate seasonal change in the sky and the position of the sun at various times of the year.
B. Show the relationship between the positions of the sun and moon at different phases. Demonstrate the waxing moon in the early evening sky.
C. Demonstrate the waning moon in the morning sky.
D. Demonstrate a complete lunation.
E. Make a comparison of the relative sizes of the sun and moon.
F. Identify some of the appropriate constellations.

The planetarium visit will be further developed into a planetarium program. The number of effects, projectors, and audiotapes with music and voice to be used will vary with respect to each planetarium and its resources. Correlation with the school program should in no way limit the use of the dramatic approach, which continues to make the planetarium visit an exciting event. It is the content that counts, and subject matter and special effects might be judged by asking:

1. Is it scientifically accurate?
2. Does it serve a useful purpose?
3. Does it fit into the sequence of learning experiences to be presented?
4. Is it appropriate for the age level of the audience?
5. Does it provide a meaningful learning experience?

To achieve their full potential, all planetarium programs including public sky shows, teachers' courses, and adult evening extension should receive the same careful planning and evaluation as shown in the school presentation outlined above.

CONCLUSION

It is tempting to continue business as usual without the task of planning, executing, and evaluating each planetarium presentation in terms of its educational contribution. But experience has shown that even such a great motivating device as a planetarium projector with its ability to bring the very universe to our doorstep cannot function effectively unless it provides a meaningful experience for the viewer. Perhaps the astronomer Strömgren best expressed these thoughts
when he said (quoted by Werner):

But never before has a means of viewing the heavens been produced with an educational value comparable to this, nor one with so magical effect, nor one that appeals to all and sundry in the same degree as this . . . . It is school, theatre and cinema in one; a schoolroom beneath the dome of the sky and a play in which the stars and planets are the actors. Clearly, whoever demonstrates this sensitive instrument must himself possess imagination in addition to a wide and profound understanding of astronomy. Here perhaps we shall discover the Achilles heel of the planetarium idea.

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