The launchings of Sputniks One and Two prompted President Eisenhower's messages on technology and science, messages that have more sharply focused the attention of the public upon the nationwide need for broader and more effective science education. It is appropriate that all institutions which can assist in meeting this need should reappraise their functions to ascertain if they are as effective as they could be and ought to be.

Planetariums have an important role to play in the development of science-mindedness in the public. When the public becomes aware of the implications of science for the maintenance of a high standard of living and, indeed, for survival itself, they will demand that science be given its rightful status in the educational curricula of elementary and secondary schools and they will promote salutary attitudes toward science in their family groups. It has become increasingly apparent that young people are not always making wise choices when they are entirely free to select those subjects which they will study in high school. To a large measure, educators are allowing youngsters to determine what a school shall offer, which implies that educators are allowing these same youngsters to shape and mold the nature of civilization itself in the years to come. Freedom is the keystone of our way of life, and there should be some freedom in our educational system; but freedom is for those who assume responsibility. Freedom without responsibility is license; it leads to chaos and destruction.

People make wise decisions when they have a background of experience and knowledge. It is essential that young people and their parents should appreciate the meaning of science, that they should be inspired by its subject matter and by its implications.
The basic purposes of the American Museum–Hayden Planetarium are to elucidate these meanings and understandings, to present facts and ideas of astronomy in a dynamic manner, and to open up new avenues of thought. A planetarium is a unique educational organization that blends together entertainment and learning, and by so doing stimulates thinking and establishes desires to know.

An important operation of the Planetarium is provision of ways in which this curiosity can be satisfied and further stimulated. As part of our welcome of audiences to performances, we show a slide stating that courses in astronomy, navigation and meteorology are offered by the Planetarium, and audiences are directed to ask at the box office for a catalogue that describes the various courses. The largest number of our registrants learn about the courses in this manner. However, we also send out press releases which many papers pick up, we place posters in libraries, schools, business offices, and other strategic locations. In addition, members of the staff use every opportunity to mention our courses in their public lectures and in their radio and television appearances.

These mediums of communication, together with word-of-mouth advertising, have been effective in acquainting the public with our various courses. The totals given below indicate the extent of our formal class operations for the years indicated.

<table>
<thead>
<tr>
<th>Course</th>
<th>'53-'54</th>
<th>'54-'55</th>
<th>'55-'56</th>
<th>'56-'57 (last half)</th>
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</thead>
<tbody>
<tr>
<td>Astronomy for the Family</td>
<td>50</td>
<td>72</td>
<td>33</td>
<td>49</td>
</tr>
<tr>
<td>Star Identification</td>
<td>34</td>
<td>35</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Introduction to Astronomy</td>
<td>56</td>
<td>72</td>
<td>107</td>
<td>123</td>
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<tr>
<td>Stars and the Galaxy</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>36</td>
</tr>
<tr>
<td>Astronomy Seminar</td>
<td>...</td>
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<td>...</td>
<td>8</td>
</tr>
<tr>
<td>Introduction to Celestial Navigation</td>
<td>112</td>
<td>86</td>
<td>45</td>
<td>123</td>
</tr>
<tr>
<td>Advanced Celestial Navigation</td>
<td>...</td>
<td>39</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Navigation in Coastal Waters</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>47</td>
</tr>
<tr>
<td>Meteorology</td>
<td>27</td>
<td>26</td>
<td>23</td>
<td>19</td>
</tr>
</tbody>
</table>

The content, viewpoint and age level for each of the formalized courses given at the Planetarium at the present time is summarized briefly below.

ASTRONOMY FOR THE FAMILY. This course meets on ten consecutive Saturday mornings for forty-five minutes. All lectures are held in the dome where the Zeiss instrument can be used to clarify points developed by slide projection. Topics included are: sun, planets, earth, moon, asteroids, constellations, the Milky Way galaxy. Obviously, each topic
can be treated only sketchily because of time limitations. We encourage parents to attend the lectures with their children. The course is designed to meet interests of children eight through fourteen years of age. Because of this great range in age level, no single reference can be given. It is more effective to make suggestions to individuals whose reading level, background and general ability have been determined.

**STAR IDENTIFICATION.** This is an adult course that meets for ten one-hour sessions from October through December. All meetings are held in the dome, where the Zeiss instrument is used extensively. Stars of the seasonal skies are discussed, as are also stars north and south of the equator. During the current sessions considerable stellar astronomy is presented, together with considerable background of the mythological legends associated with individual stars and star groups.

**INTRODUCTION TO ASTRONOMY.** This is our most popular course. It meets once a week in the evening for ninety minutes and is a general survey of astronomy during which various aspects of the solar system, the calendar, the stars and galaxies are discussed. Many students who take this course repeat it later to clarify basic information, or go on to more advanced treatments of the subject. Telescopes are set up on the Planetarium lawn, whenever sky conditions warrant their use. Such occasions are rare, however, because the skies are either cloudy or smoky, smoggy or filled with light.

**STARS AND THE GALAXY** is a course in intermediate astronomy which considers in detail the methods astronomers use for determining the nature and appearance of stars and the Milky Way galaxy. The instructor often finds that the class wishes to pursue in more detail various topics that were treated in their introductory work. These topics may have been originally discussed in a Planetarium course or in some work taken at the undergraduate level.

**ASTRONOMY SEMINAR.** There are many students who desire to explore further certain specific problems or areas of study. The seminar approach allows a limited number of students to do this under the guidance of different members of the Planetarium staff. The class is conducted as a true seminar; that is, students explore individual problems and present their findings to the group, which may then discuss the presentation. Problems which have been explored during past seminars are: solar prominences, energy of the sun, satellites of Jupiter, atmospheres of the planets, aurora and airglow, mechanics of the solar system.

**INTRODUCTION TO CELESTIAL NAVIGATION.** This course, and the advanced section as well, appeals to airline personnel, to yachtsmen, to men and women who are engaged in the manufacture and sale of navigation equipment, and to private individuals who have use for such specialized knowledge. The course meets for ten ninety-minute sessions, and runs
through both the fall and spring semesters. The Planetarium dome is used extensively to clarify the celestial triangle, celestial lines of position, the observing of celestial bodies, fixes by the stars. Practice with H.O. 214 (Hydrographic Office Publication #214) and the American Nautical Almanac is an integral part of the course.

**Navigation in Coastal Waters.** This course, which meets for ten ninety-minute sessions, is designed for present and prospective owners of small craft, or for those interested in beginning a complete program in navigation. Emphasis is placed on practical problems relating to the use of charts, compasses, aids to navigation, and methods of safe piloting. Specific topics include charts and tools, buoyage system, compass and compass error, plotting lines, the running fix, current vectors, time, speed and distance. A large percentage of class time is devoted to the solving of practical navigation problems.

**Meteorology.** This course, which meets for ten ninety-minute sessions, helps the layman understand the causes of weather, the meaning of forecasts, the science of measurement and forecasting. Films and slides are used extensively to present topics such as: the ocean of air, wind and water, air masses and fronts, clouds, storms, hurricanes and tornadoes, measuring and forecasting.

**Specialized Courses.** The New York City school system is in the process of incorporating a dynamic science program into its curriculum of elementary education. Many of the teachers who will be implementing this program have very little, if any, background in science. The Planetarium has redirected its presentation for teachers to develop the relationship of astronomy to the rest of the curriculum, and to give the teachers the security and confidence that comes from a background of knowledge. The learning of facts is considered important, for thinking cannot take place in a vacuum; the mind demands data to work with. However, the facts are related to all-pervading concepts, which astronomy is uniquely fitted to develop: the idea that change is a continuous condition of the universe; the tremendous variety there is in the stars, galaxies, nebulae and other components of the universe; appreciation of time and space; the interrelationships between planets and satellites, planets and the sun, the sun and stars, stars and galaxies.

This is an in-service education course which is now accepted for full credit by the Board of Superintendents of New York City. It meets in two-hour sessions that continue through fifteen weeks.

**Astronomy in Elementary and Secondary Education** is a course that is given in cooperation with colleges and universities. The course is designed for teachers who are working toward advanced degrees. Arrangements for this course are under discussion with educational institutions in the area, and we hope to offer it in our regular schedule during the
next school year, or possibly to inaugurate it during the summer of 1958.

DESCRIPTIVE ASTRONOMY—COLLEGE LEVEL. There are scores of undergraduate schools in the metropolitan area which do not offer astronomy, primarily because of lack of personnel and/or lack of equipment. The Planetarium feels that many students in these institutions would study astronomy if an opportunity were presented. Therefore, the Planetarium has set up a course in astronomy on the college level. It meets for a total of forty-five hours, and carries three points of credit. Registration for the course is through the cooperating university or college.

SPECIAL PROGRAM FOR COLLEGES. This program consists of single lectures, or series of lectures, that are developed after consultation with the college instructor. The program meets the needs of schools that offer astronomy as a course in a general education program, or astronomy as part of a survey of the physical sciences, civil engineering and surveying.

This program has expanded considerably in the past few years, and indications are that more and more institutions will take advantage of this service in the future.

THE SKY EXPLORERS is a series of lectures for young people at twelve noon on Saturdays throughout the year. Attendance at the lectures is by reservation. Topics treated include the solar system, the stars, the Milky Way and other galaxies. These lectures provide the basic information for qualification in astronomy for such groups as the Girl Scouts, Boy Scouts, Camp Fire Girls, Catholic Youth Organization. Annual attendance is approximately six thousand young people.

POPULAR SCHOOL COURSES. In addition to the above courses, which are organized formally, the Planetarium has an ambitious program that appeals to school groups. The current popular show is presented each morning to groups of children who have made reservations ahead of time. In the course of a twelve-month period, this program has an attendance of 85,000 youngsters and their teachers, at a conservative estimate. While the special projection and sound effects of the popular show are used in these shows for young people, the lecturer modifies his approach to meet the interests and backgrounds of the youngsters.

In addition to giving constant attention to the consideration of courses which can be planned for the future, the Planetarium is sensitive to the needs of the community—those needs which may develop because of current happenings. On October 17, 1957, for example, less than two weeks after Sputnik One was launched and the age of space began, the first meeting of a special lecture series on man-made satellites was given to a subscription audience of some 300 newsmen, housewives, television and radio people, businessmen. The series was eminently successful—so much so that it is being repeated in early 1958 and may well become an on-going part of the standard course offering.
The various courses are taught for the most part by the regular staff members of the Planetarium as part of their regular duties. However, instructors in colleges and universities in the area are also invited to teach. They bring in ideas which are often incorporated into the Planetarium's educational philosophy. Thus, the procedure is a dynamic one, and, we believe, always improving.

It is our hope that the educational programs of the Planetarium perform at least two important services in addition to the basic service of partially satisfying man's insatiable curiosity about the world he lives in. First, the Planetarium tries to engender science interests in young people that will stay with them as they mature. Second, it attempts to help adults understand the place of science in their daily lives, so they can more intelligently influence the legislation on which the future depends.